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ABSTRACT

Designed to provide a basic core of instruction for the third year of agriculture in Oklahoma, this guide is for use by teachers and their eleventh grade students. Instructional content is in five sections, each with four or more units: soil science, leadership, animal science, farm business management, and agricultural mechanics. Each unit contains behavioral objectives in two forms, unit objectives (stating subject matter to be covered in the unit) and specific objectives (stating student performance necessary to reach unit objectives). It is suggested that objectives be reviewed by teacher and student, and that the teacher feel free to add objectives which will correlate material to community and student needs. Each unit includes suggested activities and accompanying materials (assignment sheets, job sheets, test sheets and answers, information sheets, visual aids). Information sheets include the content needed for meeting the cognitive objectives of the unit. Assignment sheets provide paper and pencil learning activities which give direction to study and can be used for checking student progress. Answers are also included. (FP)

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Vocational Agriculture III

A CURRICULUM GUIDE
11th Grade

Written by
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Stillwater, Oklahoma
1972

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State Department of Vocational and Technical Education
Stillwater, Oklahoma
1978

U.S. DEPARTMENT OF HEALTH,
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NATIONAL INSTITUTE OF
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Developed by the Curriculum and Instructional Materials Center
For the Division of Vocational Agriculture Education
Ralph Dreessen, State Supervisor
OKLAHOMA STATE BOARD OF VOCATIONAL AND TECHNICAL EDUCATION
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FOREWORD

This publication is designed to provide a basic core of instruction in vocational agriculture in Oklahoma.

Today, teachers of vocational agriculture are faced with increasing problems of what to teach and whom to serve. The students of today, who will be the agriculturists of tomorrow, need to be well-educated individuals who constantly seek information on which to base the many decisions they are required to make.

The purpose of this guide is to assist teachers in improving instruction in Vocational Agriculture III in Oklahoma.

Appreciation is expressed to the many individuals who helped in the development of this publication; teaching of vocational agriculture should become more effective with its use.

Francis T. Tuttle, State Director
State Department of Vocational and
Technical Education

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PREFACE

Until recently, most vocational agriculture graduates were returning to the farm. Now an increasing number are entering occupations other than farming with a large percent finding employment in the field of agribusiness. Not only do the technical areas of agriculture require new materials, but the ever-changing demands of the agricultural industry require the student to become highly skilled in many areas, resulting in the need for an up-to-date curriculum.

Every effort has been made to make this publication basic, readable, and by all means usable. This writer will be the first to admit that the publication does not cover every area of agricultural training that the student needs, but it does provide the basics and the opportunity for a student to progress from one year's study to the next without a great deal of repetition.

Three vital parts of instruction have been left out of the publication intentionally: motivation, personalizing, and localizing. These areas are left to the individual instructors, and such instructors should capitalize on them; then and only then will this publication really become a vital part of the teaching-learning process. Many instructors may wish to supplement this publication with additional materials which they feel are necessary for their particular area of the state; by all means they should do so.

At the close of teaching this publication, each instructor should be able to say that this approach to teaching is *the way* because all the resources are focused toward a measurable outcome. The student should be able to perform at a higher level because both the student and the instructor know exactly where each is going.

During the past eight years the Curriculum and Instructional Materials Center staff has strived to develop and disseminate the best instructional materials possible. Every effort has been made to insure success with implementation of this curriculum. The CIMC's resources are always available to vocational teachers.

Bob Patton, Coordinator
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Special appreciation and thanks go to Sheila Stone, Curriculum Editor, who spent many long hours working to make this curriculum one of the best. Appreciation is also expressed to the remainder of the Curriculum staff for their assistance and to the Graphics Division for the typing, art, and printing.

USE OF THIS PUBLICATION

Instructional Units

Vocational Agriculture III includes six areas. Each area consists of four or more units of instruction. Each instructional unit includes behavioral objectives, suggested activities for teacher, information sheets, assignment sheets, job sheets, visual aids, tests, and answers to assignment sheets and tests. Units are planned for more than one lesson or class period of instruction.

Careful study of each instructional unit by the teacher will help determine:

A. The amount of material that can be covered in each class period
B. The skills which must be demonstrated
    1. Supplies needed
    2. Equipment needed
    3. Amount of practice needed
    4. Amount of class time needed for demonstrations
C. Supplementary materials, such as pamphlets and filmstrips, that must be ordered
D. Resource people who must be contacted

Objectives

Each unit of instruction is based on behavioral objectives. These objectives state the goals of the course, thus providing a sense of direction and accomplishment for the student.

Behavioral objectives are stated in two forms: unit objectives, stating the subject matter to be covered in a unit of instruction; and specific objectives, stating the student performance necessary to reach the unit objective.

Since the objectives of the unit provide direction for the teaching-learning process, it is important for the teacher and students to have a common understanding of the intent of the objectives. A limited number of performance terms have been used in the objectives for this curriculum to assist in promoting the effectiveness of the communication among all individuals using the materials.

Following is a list of performance terms and their synonyms which may have been used in this material:

Name	Identify	Describe
Label	Select	Define
List in writing	Mark	Discuss in writing
List orally	Point out	Discuss orally
Letter	Pick out	Interpret
Record	Choose	Tell how
Repeat	Locate	Tell what
Give		Explain

Order
Arrange
Sequence
List in order
Classify
Divide
Isolate
Sort

Distinguish
Discriminate

Construct
Draw
Make
Build
Design
Formulate
Reproduce
Transcribe
Reduce
Increase
Figure

Demonstrate
Show your work
Show procedure
Perform an experiment
Perform the steps
Operate
Remove
Replace
Turn off/on
(Dis) assemble
(Dis) connect

Reading of the objectives by the student should be followed by a class discussion to answer any questions concerning performance requirements for each instructional unit.

Teachers should feel free to add objectives which will fit the material to the needs of the students and community. When a teacher adds objectives, he/she should remember to supply the needed information, assignment and/or job sheets, and criterion tests.

Suggested Activities

Each unit of instruction has a suggested activities sheet outlining steps to follow in accomplishing specific objectives. Duties of the instructor will vary according to the particular unit. However, for best use of the material they should include the following: provide students with objective sheet, information sheet, assignment sheets, and job sheets; preview filmstrips, make transparencies, and arrange for resource materials and people; discuss unit and specific objectives and information sheet; give test. Teachers are encouraged to use any additional instructional activities and teaching methods to aid students in accomplishing the objectives.

Information Sheet

The information sheet provides content essential for meeting the cognitive (knowledge) objectives of the unit. The teacher will find that the information sheet serves as an excellent guide for presenting the background knowledge necessary to develop the skill specified in the unit objective.

Students should read the information sheet before the information is discussed in class. Students may take additional notes on the information sheet.

Transparency Masters

Transparency masters provide information in a special way. The students may see as well as hear the material being presented, thus reinforcing the learning process. Transparencies may present new information or they may reinforce information presented in the information sheet. They are particularly effective when identification is necessary.

Transparencies should be made and placed in the notebook where they will be immediately available for use. Transparencies direct the class's attention to the topic of discussion. They should be left on the screen only when topics shown are under discussion. (NOTE: The teacher should stand away from the overhead projector when discussing transparency material. The noise of the projector may cause the teacher to speak too loudly.)

Assignment Sheets

Assignment sheets give direction to study and furnish practice for paper and pencil activities to develop the knowledges which are necessary prerequisites to skill development. These may be given to the student for completion in class or used for homework assignments. Answer sheets are provided which may be used by the student and/or teacher for checking student progress.

Job Sheets

Job sheets are an important segment of each unit. The instructor should be able to and in most situations should demonstrate the skills outlined in the job sheets. Procedures outlined in the job sheets give direction to the skill being taught and allow both student and teacher to check student progress toward the accomplishment of the skill. Job sheets provide a ready outline for a student to follow if he/she has missed a demonstration. Job sheets also furnish potential employers with a picture of the skills being taught and the performances she/he might reasonably expect from a person who has had this training.

Test and Evaluation

Paper-pencil and performance tests have been constructed to measure student achievement of each objective listed in the unit of instruction. Individual test items may be pulled out and used as a short test to determine student achievement of a particular objective. This kind of testing may be used as a daily quiz and will help the teacher spot difficulties being encountered by students in their efforts to accomplish the unit objective. Test items for objectives added by the teacher should be constructed and added to the test.

Test Answers

Test answers are provided for each unit. These may be used by the teacher and/or student for checking student achievement of the objectives.

Page Numbering System

Each section in this publication is assigned a specific letter: (A) Plant and Soil Science; (B) Leadership; (C) Animal Science; (D) Farm Business Management; (E) Agricultural Mechanics. Pages are numbered consecutively within each section. For example, Plant and Soil Science covers pages 1-A through 191-A. If the page is available as a transparency master, TM appears at the bottom of the page.

The following key will help to easily identify each section by color:

White - Objectives, suggested activities, and transparency masters

Green - Information sheets

Buff - Assignment sheets

Blue - Job sheets

Yellow - Tests

Pink - Answers to assignment sheets and answers to tests

Section A
Plant and soil Science

[redacted]

FERTILIZERS
UNIT I

UNIT OBJECTIVE

After completion of this unit, the student should be able to identify deficiency symptoms of the major plant nutrients while observing the growing plant. The student should be able to take soil test information or plant growth information and determine the amount of fertilizer to apply. This knowledge will be evidenced by completion of assignment sheets and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with fertilizers to the correct definitions.
2. Select from a list factors that influence the use of fertilizers.
3. Match the major (primary) plant nutrients to the correct characteristics.
4. Match the minor (secondary) plant nutrients to the correct characteristics.
5. Match nutrients to their deficiency symptoms.
6. Select from a list the information that must be stamped on fertilizer bags according to state law.
7. Match types of fertilizer analyses to the correct descriptions.
8. Match dry, liquid, and gas fertilizers to the correct descriptions.
9. List the percent nutrient value of specified fertilizers.
10. Read a pH scale to determine if the soil is acid, neutral, or alkaline.
11. Name ways liming benefits plant growth.
12. Classify plants according to the most desirable pH scale range.
13. Name factors to consider in caring for fertilizer equipment.
14. Calculate problems comparing the cost per pound of nitrogen.

15. Calculate problems determining application rates of fertilizers.

16. Collect plants with fertilizer deficiencies.

17. Calculate number of pounds of actual nitrogen, phosphorus, and potassium available from different fertilizer analyses.

18. Make fertilizer recommendations.

19. Complete a soil analysis form.

FERTILIZERS
UNIT I

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

   A. Provide student with objective sheet.

   B. Provide student with information and assignment sheets.

   C. Make transparencies.

   D. Discuss unit and specific objectives.

   E. Discuss information sheet.

   F. Take soil sample from school yard or school farm to be analyzed by local county extension office for test results.

   G. Contact local fertilizer dealer for samples of different fertilizers.

   H. Grow sample plants in glasses of water and show student difference in fertilized plants and nonfertilized plants.

   I. Have student take a soil sample of home farm for analysis at local county extension office.

   J. Develop a fertilizer test plot for student to observe different fertilizing methods and rates.

   K. Give test.

II. Instructional materials:

   A. Objective sheet

   B. Information sheet

   C. Transparency masters

      1. TM 1--Essential Elements

      2. TM 2--Required Fertilizer Bag Information

      3. TM 3--Fertilizer Analysis

      4. TM 4--pH Scale

D. Assignment sheets

   1. Assignment Sheet #1--Collect Plants with Fertilizer Deficiencies

   2. Assignment Sheet #2--Calculate Number of Pounds of Actual Nitrogen, Phosphorus, and Potassium Available from Different Fertilizer Analyses

   3. Assignment Sheet #3--Make Fertilizer Recommendations

   4. Assignment Sheet #4--Complete a Soil Analysis Form

   5. Assignment Sheet #5--Calculate Cost per Pound of Nitrogen for Different Fertilizer Analyses

   6. Assignment Sheet #6--Calculate Application Rates of Fertilizers

E. Answers to assignment sheets

F. Test

G. Answers to test

III. Unit references:

A. McVickar, Malcolm H. *Using Commercial Fertilizers.* Danville, Illinois: The Interstate Printers and Publishers, Inc., 1970.

B. Cook, R. L. *Soil Management.* New York: John Wiley and Sons, Inc., n.d.

C. Agriculture Extension Service. *Know Your Fertilizers.* Circular 635. Stillwater: Oklahoma State University, n.d.

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E. Tucker, Billy B. "Know Your Fertilizer: Secondary and Micronutrients." *OSU Extension Facts*, no. 2222. Stillwater: Oklahoma State University/Agriculture Extension Service, n.d.

F. Tucker, Billy B. "Know Your Fertilizer: Major Elements." *OSU Extension Facts,* no. 2221. Stillwater: Oklahoma State University/Agriculture Extension Service, n.d.

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FERTILIZERS
UNIT I

INFORMATION SHEET

I. Terms and definitions

A. Fertilizer--Natural, manufactured, or processed material or mixture of materials that contains one or more of the recognized plant food elements; available in dry, liquid, or gas form

B. Formula--Quantity and grade of materials used in making a fertilizer mixture

C. Ratio--Proportion of nitrogen, phosphate, and potash in a fertilizer

D. Grade--Total of the fertilizer analysis

E. Analysis--Percent content of total nitrogen (N), phosphorus (P) expressed as P_2O_5, and water-soluble potassium (K) expressed as K_2O available in the fertilizer

F. Brand--Trademark of the company which produced the fertilizer

G. Carrier--Fertilizer containing only one nutrient

H. Complete fertilizer--Fertilizer which supplies all three of the major nutrients

I. Mixed fertilizer--Mixture of two or more carriers

J. Filler--Material which does not contain N, P_2O_5, or K and is added for weight to the fertilizer

Examples: Sand, rock, sawdust

K. pH--Degree of acidity or alkalinity of the soil

L. Acid soil--Soil having an acid reaction because the pH is below 7.0

M. Alkaline soil--Soil having a basic reaction because the pH is above 7.0

N. Organic soil--Soil containing 20% or more organic matter

O. Alkali--Soil that contains enough exchangeable sodium to adversely affect the growth of most crops

P. Yield possibility--Yield obtained for a given cropping situation when all nutrients are adequate

INFORMATION SHEET

Q. Percent sufficiency--Percent of the yield possibility obtained because of the deficiency of a plant nutrient

II. Factors that influence fertilizer use

A. Chemical condition of soil

(NOTE: The chemical condition of the soil is dependent on the availability of total nutrients in the soil.)

B. Crops

(NOTE: The type of fertilizer to use is determined by the value of the crop when it reaches market and the crop's ability to absorb the different nutrients when they are available.)

C. Physical condition of soil

(NOTE: Moisture content, soil texture, and the ability to prevent leaching are important physical conditions to consider in fertilizer use.)

D. Insects and diseases

E. Climatic conditions

F. Time

III. Characteristics of major (primary) plant nutrients (Transparency 1)

A. Nitrogen

1. Is part of every living cell
2. Gives dark green color to chlorophyl molecule
3. Aids and promotes seed development
4. Increases protein and yields
5. Promotes rapid growth
6. Is easily translocated

INFORMATION SHEET

B. Phosphorus

   1. Is part of every living cell
   2. Contributes to early maturing crops
   3. Is necessary for seed formation
   4. Stimulates root growth
   5. Is easily translocated

C. Potassium

   1. Is necessary for production and translocation of carbohydrates
   2. Produces plumper seed
   3. Controls water intake and respiration
   4. Promotes health and vigor of plants
   5. Stiffens straw and stalks

      (NOTE: Potash aids in producing stiff stems which will reduce lodging.)

   6. Is easily translocated

IV. Characteristics of minor (secondary) plant nutrients (Transparency 1)

A. Calcium

   1. Speeds decay of organic matter
   2. Stimulates formation of nitrates
   3. Promotes root and leaf growth
   4. is necessary for nodulation of legumes

B. Magnesium

   1. Is necessary for chlorophyl or green coloring
   2. Increases absorption of phosphorus
   3. Aids in formation of fats and oils
   4. Is important in plant enzyme system

INFORMATION SHEET

C. Sulfur

1. Is necessary for nodule formation on legumes
2. Is associated with plant enzyme systems
3. Is easily translocated

(NOTE: Other trace elements needed by plants in minute amounts for proper plant growth include manganese, boron, copper, zinc, and iron.)

V. Symptoms of nutrient deficiencies (Assignment Sheet #1)

A. Nitrogen

1. Stunted and spindly
2. Yellowish green foliage
3. Older leaves affected first
4. Leaf margins remain green

B. Phosphorus

1. Stunted growth
2. Abnormally green appearance
3. Purple leaves in advanced stages
4. Older leaves affected first

C. Potassium

1. Shorter plants
2. General loss of green color
3. Leaf margins affected first

D. Magnesium

1. General yellowing
2. Older leaves affected first
3. Reddish purple leaves in advanced stages, especially the leaf edges
4. Veins remain green
5. Leaves may curl downward

INFORMATION SHEET

VI. Fertilizer bag requirements (Transparency 2)

A. Name, brand, or trademark

B. Analysis (guaranteed chemical composition)

C. Net weight

D. Name and address of manufacturer

VII. Fertilizer analyses (Transparency 3, Assignment Sheet #2)

(NOTE: A fertilizer analysis consists of three figures. These three figures indicate the plant nutrient content of the material. The first figure represents the actual pounds of total nitrogen available in 100 pounds of fertilizer. The second figure represents the actual pounds of total phosphorus available expressed as P_2O_5. The third figure represents the actual pounds of water-soluble potash expressed as K_2O.)

A. Ordinary analysis--Less than 20% plant food

Example: 5-5-5

B. High analysis--20% to 30% plant food

Example: 5-10-5

C. Concentrated analysis--Over 30% plant food

Examples: 20-20-20; 82-0-0

VIII. Types of fertilizers

A. Dry mixed--Granulated fertilizer made by combining selected plant food materials to obtain certain ratios and quantities of plant nutrients

B. Liquid--Fertilizer made by dissolving the correct proportion of the solid plant food carriers into water or by neutralizing phosphoric acid with ammonia

C. Gas--Liquid fertilizer containing solid fertilizer materials which is dispersed under pressure and usually contains a higher analysis than clear liquid mixes

INFORMATION SHEET

IX. Fertilizer nutrient value classification

A. Nitrogen

1.	Anhydrous ammonia	82%	82-0-0 grade
2.	Urea	45%	45-0-0 grade
3.	Ammonium nitrate	33%	33-0-0 grade
4.	Ammonium sulfate	21%	21-0-0 grade

B. Phosphate

1.	Phosphoric acid	50-54%	0-54-0 grade
2.	Concentrated superphosphate	44-48%	0-45-0 grade
3.	Ammonium phosphate	35-50%	18-46-0 grade
4.	Rock phosphate	30-34%	
5.	Nitric phosphate	10-20%	many grades

C. Potash (potassium)

1.	Muriate of potash	60-63%	0-0-60 grade
2.	Potassium sulfate	50-53%	0-0-50 grade
3.	Potassium nitrate	44-46%	13-0-44 grade

X. pH scale (Transparency 4, Assignment Sheets # 3 and #4)

A. Acid--0 to 6.9

B. Neutral--7.0

C. Alkaline--7.1 to 14.0

(NOTE: The pH scale is divided into 14 divisions or pH units. Soils with a pH value of 7.0 are neutral. Soils with a value below 7.0 are said to be acid; while those above 7.0 are alkaline. A pH of 6.0 is 10 times more acid than a pH of 7.0, and a pH of 5.0 is 10 times as acid as a pH of 6.0 or 100 times as acid as one with a pH of 7.0. The pH value of most soils falls in the range between 4.0 and 8.0. A pH of about 6.5 is considered desirable for most plants.)

INFORMATION SHEET

XI. Effects of liming on plant growth

   A. Corrects soil acidity

   B. Reduces solubility of toxic elements

   C. Supplies calcium and magnesium

   D. Improves biological activity

   E. Improves physical condition of soil

   F. Makes fertilizers more effective and efficient

   G. Improves yields

XII. Desirable plant pH scale

   A. Strongly acid (5.0 to 5.5)

      1. Potatoes

      2. Watermelons

   B. Medium to moderately acid (5.5 to 6.5)

      1. Wheat

      2. Soybeans

      3. Sorghum (milo)

      4. Corn

      5. Vetch

      6. Bermudagrass

      7. Peanuts

      8. Cotton

      9. Sudangrass

      10. Oats

      11. Rye

   C. Slightly acid to slightly alkaline (6.5 to 7.5)

      1. Alfalfa

      2. Sweet clover

INFORMATION SHEET

XIII. Care of fertilizer equipment

A. Remove all fertilizer from hopper after use

B. Clean hopper thoroughly with water

C. Allow hopper to dry

D. Clean out auger

E. Apply a mixture of 50% kerosene and oil to hopper

(NOTE: Fertilizer should be stored in a dry location, with no direct contact with outside walls or concrete floor. If storage location has a concrete floor, use lumber to construct a false floor.)

XIV. Calculating cost of nitrogen (Assignment Sheet #5)

A. Multiply percent of nitrogen x 2000 lbs/ton

B. Divide pounds of nitrogen in one ton into the cost per ton

Example: $136.00 per ton

33.0% nitrogen in 100 pounds
x 20 100-pound bags in a ton
660.0 pounds of nitrogen in one ton

$$660\overline{)136.00}^{\;0.2060} = 20.6 \text{ cents per pound}$$

XV. Calculating application rates (Assignment Sheet #6)

A. Determine pounds of nutrient needed

B. Divide by percent of nutrient in fertilizer

Example: $$\frac{40 \text{ lbs of } K_2O \text{ needed}}{50 \text{ percent } K_2O \text{ in fertilizer}} = 80 \text{ lbs of 0-0-50 needed per acre}$$

Essential Elements

NON-MINERAL

- Carbon
- Hydrogen
- Oxygen

PRIMARY

- Nitrogen
- Phosphorus
- Potassium

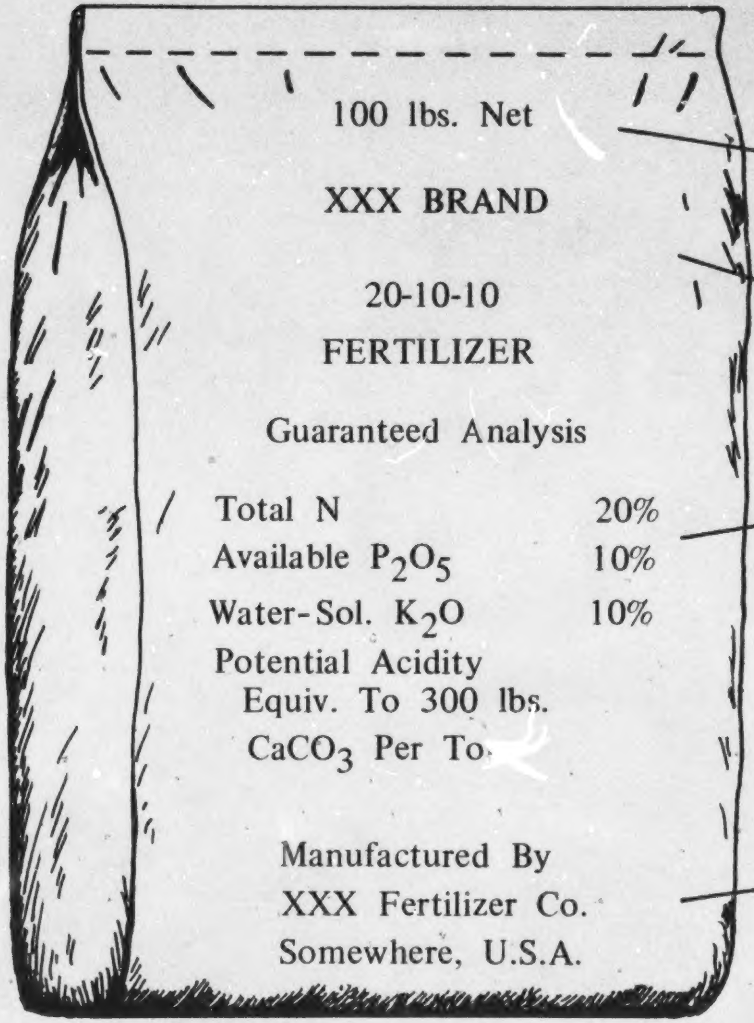
SECONDARY

- Calcium
- Magnesium
- Sulfur

MICRO-ELEMENTS

- Iron
- Chloride
- Manganese
- Boron
- Zinc
- Copper
- Molybdenum

Required Fertilizer Bag Information



100 lbs. Net

XXX BRAND

20-10-10
FERTILIZER

Guaranteed Analysis

Total N	20%
Available P_2O_5	10%
Water-Sol. K_2O	10%

Potential Acidity
Equiv. To 300 lbs.
$CaCO_3$ Per To

Manufactured By
XXX Fertilizer Co.
Somewhere, U.S.A.

Lbs. per Bag

Name or Brand of Fertilizer

Chemical Composition Guaranteed

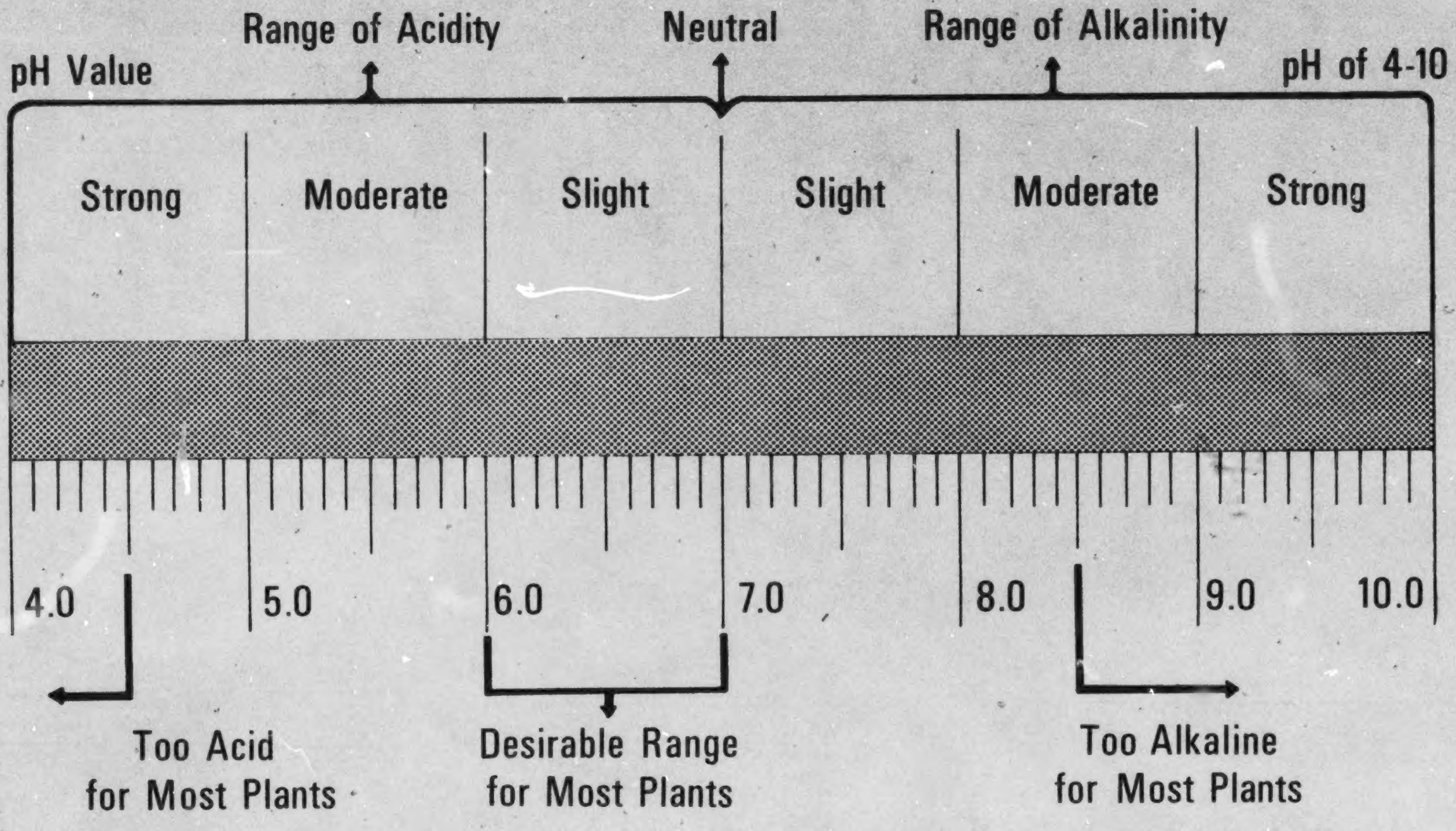
Name and Address of Manufacturer

Fertilizer Analysis

20 – 10 – 10

20	10	10
↑	↑	↑
Total Nitrogen Available	Total Phosphorus Expressed as P_2O_5	Water Soluble Potash Expressed as K_2O

pH Scale


Range of Acidity
Neutral
Range of Alkalinity
pH Value
pH of 4-10
Strong
Moderate
Slight
Slight
Moderate
Strong
4.0
5.0
6.0
7.0
8.0
9.0
10.0
Too Acid for Most Plants
Desirable Range for Most Plants
Too Alkaline for Most Plants

FERTILIZERS
UNIT I

ASSIGNMENT SHEET #1--COLLECT PLANTS WITH FERTILIZER DEFICIENCIES

Collect five plants showing fertilizer deficiencies. After collecting the plants, identify the deficiency, recommend treatment, and turn in to your instructor for evaluation.

	Plant	Deficiencies	Recommended Treatment
1.			
2.			
3.			
4.			
5.			

FERTILIZERS
UNIT I

ASSIGNMENT SHEET #2--CALCULATE NUMBER OF POUNDS OF ACTUAL NITROGEN, PHOSPHORUS, AND POTASSIUM AVAILABLE FROM DIFFERENT FERTILIZER ANALYSES

Compare the pounds of actual nitrogen, phosphorus, and potassium available for each fertilizer. When you have completed the problems, turn in to your instructor for evaluation. Use 100 lbs as a base for all problems.

1. Fertilizer analysis 10-20-10

2. Fertilizer analysis 82-0-0

3. Fertilizer analysis 18-46-0

4. Fertilizer analysis 13-0-44

FERTILIZERS
UNIT I

ASSIGNMENT SHEET #3--MAKE FERTILIZER RECOMMENDATIONS

Using the soil test information given and the Fertilizer Recommendation Guide, recommend the amount of fertilizer needed for each problem. Also make recommendations concerning the amount of lime to use according to the pH of the soil. When completed, return to instructor for evaluation.

1. Laboratory soil test for wheat crop with a yield goal of 40 bushels per acre plus grazing:

Soil & Water Laboratory
Agronomy Department

Oklahoma State University Extension
Stillwater, Oklahoma 74074

Sender's Sample No.________ State Lab No.________

County________ Farm No.________ Field No.________ Acres________

Name________ Address________

Sample Location________

Soil is: (circle one in each column)

[✓ Level]	[✓ Not eroded]	[✓ Upland]	Sand	Deep
Gently sloping	Eroded	Bench	Sandy loam	[✓ Moderately deep]
Rolling	Severely eroded	Bottom	[✓ Loam]	Shallow
			Clay	Very shallow

CROP HISTORY — FERTILIZER HISTORY

Last Year Wheat Yield 30 bu. Kind & Amt. of Fert. 40-40-0

2 Years Back________ Yield________ Kind & Amt. of Fert.________

3 Years Back________ Yield________ Kind & Amt. of Fert.________

Lime Used
When?________ How Much?________

Circle one

[✓ Dryland] Irrigated (ample water) Irrigated limited water

Crop to be grown Wheat Yield Goal 40 bu. + grazing

Production Problems Area is stubble mulched

ANALYSES			RECOMMENDATION
Soil pH	7.1	Lime	
Buffer Index			
% O. M.		N	
Nitrate (surf)	20		
Nitrate (sub)	20		
Phosphorus	18	P_2O_5	
Potassium	450	K_2O	
Calcium		Ca	
Magnesium		Mg	
Iron		Fe	
Zinc		Zn	
Manganese		Mn	
Boron		B	
Other			

Remarks:________

ASSIGNMENT SHEET #3

2. Laboratory soil test for peanut crop with a yield goal of 4000 lbs:

Soil & Water Laboratory
Agronomy Department

Oklahoma State University Extension
Stillwater, Oklahoma 74074

Sender's Sample No. State Lab No.

County Farm No. Field No. Acres

Name Address

Sample Location

Soil is: (circle one in each column)

[✓ Level]	[✓ Not eroded]	[✓ Upland]	[✓ Sand]	[✓ Deep]
Gently sloping	Eroded	Bench	Sandy loam	Moderately deep
Rolling	Severely eroded	Bottom	Loam	Shallow
			Clay	Very shallow

CROP HISTORY FERTILIZER HISTORY

Last Year Wheat Yield 40 bu. Kind & Amt. of Fert. 80 lbs. 10-60-0

2 Years Back Yield Kind & Amt. of Fert.

3 Years Back Yield Kind & Amt. of Fert.

Lime Used
When? How Much?

Circle one

Dryland [✓ Irrigated (ample water)] Irrigated-limited water

Crop to be grown Peanuts Yield Goal 4,000 lbs.

Production Problems

ANALYSES			RECOMMENDATION
Soil pH	6.4	Lime	
Buffer Index			
% O. M.			
Nitrate (surf)	30	N	
Nitrate (sub)	10		
Phosphorus	75	P_2O_5	
Potassium	600	K_2O	
Calcium		Ca	
Magnesium		Mg	
Iron		Fe	
Zinc		Zn	
Manganese		Mn	
Boron		B	
Other			

Remarks:

ASSIGNMENT SHEET #3

3. Laboratory soil test for soybean crop:

Soil & Water Laboratory
Agronomy Department

Oklahoma State University Extension
Stillwater, Oklahoma 74074

Sender's Sample No.________ State Lab No.________

County ________ Farm No.________ Field No.________ Acres________

Name________ Address________

Sample Location________

Soil is: (circle one in each column)

Level	[✓ Not eroded]	[✓ Upland]	[✓ Sand]	[✓ Deep]
Gently sloping	Eroded	Bench	Sandy loam	Moderately deep
[✓ Rolling]	Severely eroded	Bottom	Loam	Shallow
			Clay	Very shallow

CROP HISTORY **FERTILIZER HISTORY**

Last Year Peanuts Yield 3,000 lbs. Kind & Amt. of Fert. 600 lbs. 6-24-24

2 Years Back________ Yield________ Kind & Amt. of Fert.________

3 Years Back________ Yield________ Kind & Amt. of Fert.________

Lime Used
When?________ How Much?________

Circle one

Dryland [✓ Irrigated (ample water)] Irrigated-limited water

Crop to be grown Soybeans Yield Goal 2100 lbs.

Production Problems________

ANALYSES			RECOMMENDATION
Soil pH		Lime	
Buffer Index	6.5		
% O. M.		N	
Nitrate (surf)	15		
Nitrate (sub)			
Phosphorus	25	P_2O_5	
Potassium	200	K_2O	
Calcium		Ca	
Magnesium		Mg	
Iron		Fe	
Zinc		Zn	
Manganese		Mn	
Boron		B	
Other			

Remarks:________

OSU Extension Facts

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Science Serving Agriculture

No. 2225

Fertilizer Recommendation Guide

J. M. Baker and B. B. Tucker
Extension Soils Specialist and Extension Agronomist

The fertilizer and lime requirement of most of the crops grown in Oklahoma can be ascertained from the following tables. Note that nitrogen requirement is based on a yield goal whereas the requirement of other nutrients is based on soil test values. It is important that the tables only be used with soil tests conducted at the Soil & Water Laboratory, OSU. A full explanation of the tables can be obtained from the revised edition of OSU FACT SHEET 2208 which will be available about October 1, 1971.

NITROGEN REQUIREMENT

SMALL GRAIN[1 2 3 4]		GRAIN SORGHUM[1]		CORN (Grain)[1]		COTTON[1]	
Yield Goal Bu/A	N lbs/A	Yield Goal lbs/A	N lbs/A	Yield Goal Bu/A	N lbs/A	Yield Goal lbs/A	N lbs/A
10	0	1800	0	50	80	200	0
15	0	2600	20	75	120	300	20
20	10	3300	40	100	160	400	30
25	20	4000	60	125	200	500	40
30	30	4700	80	150	240	600	50
35	40	5400	100	175	300	700	60
40	50	6000	120	200	380	800	70
45	60	6500	140			900	80
50	85	6900	155			1000	90
55	100	7200	170			1100	100
60	15	7500	180			1200	110
		8000	200			1300	120
		8500	220			1400	130
		9000	260			1500	140
		9500	320				
		10000	360				

PHOSPHORUS REQUIREMENT

	SMALL GRAINS		GRAIN SORGHUM		CORN (Grain)		COTTON	
Soil Test lbs/A	Percent Sufficiency	P_2O_5 lbs/A	Percent Sufficiency	P_2O_5 lbs/A	Percent Sufficiency	P_2O_5 lbs/A	Percent Sufficiency	P_2O_5 lbs/A
0-10	25	60-80	40	50-60	30	60-80	55	60-75
11-20	45	40-60	60	40-50	60	40-60	70	45-60
21-40	80	20-40	80	20-40	80	20-40	85	30-45
41-65	90	starter	95	starter	95	starter	95	20-30
65+	100	none	100	none	100	none	100	none

POTASSIUM REQUIREMENT

	SMALL GRAINS		GRAIN SORGHUM		CORN (Grain)		COTTON	
Soil Test lbs/A	Percent Sufficiency	K_2O lbs/A	Percent Sufficiency	K_2O lbs/A	Percent Sufficiency	K_2O lbs/A	Percent Sufficiency	K_2O lbs/A
0-75	50	50-60	40	75-100	40	80-120	40	80-110
76-125	70	40-50	65	50-75	60	60-80	60	60-80
126-200	80	20-40	80	30-50	75	40-60	75	40-60
201-250	95	15-20	95	20-30	90	20-40	90	20-40
250+	100	none	100	0-20	100	none	100	0-20

NITROGEN REQUIREMENT

PEANUTS*	SOYBEANS	MUNGBEANS	COWPEAS AND GUAR
10-20 lbs/A in starter fertilizer	Same as peanuts plus innoculate seed	Same as peanuts plus innaculate seed	Same as peanuts plus innaculate seed

PHOSPHORUS REQUIREMENT

	PEANUTS		SOYBEANS		MUNGBEANS		COWPEAS AND GUAR	
Soil Test lbs/A	Percent Sufficiency	P_2O_5 lbs/A	Percent Sufficiency	P_2O_5 lbs/A	Percent Sufficiency	P_2O_5 lbs/A	Percent Sufficiency	P_2O_5 lbs/A
0-10	40	60-80	40	50-70	40	50-70	60	50-60
11-20	60	40-60	60	30-50	60	30-50	70	40-50
21-40	80	20-40	80	20-30	80	20-30	80	20-40
41-65	95	starter	95	starter	95	starter	95	starter
65+	100	none	100	none	100	none	100	none

POTASSIUM REQUIREMENT

	PEANUTS		SOYBEANS		MUNGBEANS		COWPEAS AND GUAR	
Soil Test lbs/A	Percent Sufficiency	K_2O lbs/A	Percent Sufficiency	K_2O lbs/A	Percent Sufficiency	K_2O lbs/A	Percent Sufficiency	K_2O lbs/A
0-75	40	60-80	40	70-80	50	60-80	60	50-60
76-125	60	40-60	60	60-70	60	45-60	70	40-50
126-200	75	30-40	75	40-60	80	30-45	80	20-40
201-250	90	20-30	90	20-40	90	20-30	95	starter
250+	100	none	100	none	100	none	100	none

NITROGEN REQUIREMENT

FORAGE SORGHUM[1,4]		COOL SEASON GRASSES[1,5] BROME, ORCHARD, FESCUE		CORN-ENSILAGE[1]		WEEPING LOVEGRASS[1,6]	
Yield Goal Tons/A	N lbs/A	Yield Goal lbs beef/A	N lbs/A	Yield Goal Tons/A	N lbs/A	Yield Goal lbs beef/A	N lbs/A
5	80	300	80-100	5	80	250	60-90
10	120	400	100-200	10	100	375	90-120
15	160	600	200-300	15	140	500	120-200
20	220			20	200		
25	280			25	280		
30	360			30	380		

PHOSPHORUS REQUIREMENT

	FORAGE SORGHUM		COOL SEASON GRASSES BROME, ORCHARD, FESCUE		CORN-ENSILAGE		WEEPING LOVEGRASS	
Soil Test lbs/A	Percent Sufficiency	P_2O_5 lbs/A	Percent Sufficiency	P_2O_5 lbs/A	Percent Sufficiency	P_2O_5 lbs/A	Percent Sufficiency	P_2O_5 lbs/A
0-10	40	75-100	30	60-80	30	60-80	50	40-60
11-20	60	50-75	50	40-60	60	40-60	70	30-40
21-40	80	25-50	70	30-40	80	20-40	85	20-30
41-65	95	starter	95	20-30	95	starter	95	starter
65+	100	none	100	none	100	none	100	none

POTASSIUM REQUIREMENT

	FORAGE SORGHUM		COOL SEASON GRASSES BROME, ORCHARD, FESCUE		CORN-ENSILAGE		WEEPING LOVEGRASS	
Soil Test lbs/A	Percent Sufficiency	K_2O lbs/A	Percent Sufficiency	K_2O lbs/A	Percent Sufficiency	K_2O lbs/A	Percent Sufficiency	K_2O lbs/A
0-75	40	130-180	60	60-70	40	80-120	40	60-80
76-125	60	90-130	70	50-60	60	60-80	60	40-60
126-200	75	60-90	80	30-50	75	40-60	80	20-40
201-250	90	30-60	90	20-30	90	20-40	95	none
250+	100	none	100	none	100	none	100	none

NITROGEN REQUIREMENT

BERMUDA[1,5]		BERMUDA AND[1,5] SMALL GRAINS		BERMUDA AND LEGUMES	ALFALFA
Yield Goal lbs beef/A	N lbs/A	Yield Goal lbs beef/A	N lbs/A		
100 250 425 600	50-100 100-175 175-250 250-350	150 325 500 700	75-125 125-200 200-300 300-400	Nitrogen may be required late in season after legumes mature for late grazing 50-60 lbs. of N every 4-6 weeks. No more than 50 lbs. of N should be applied to a bermuda-lespedeza system.	10-20 lbs/A for establishment. None needed for maintenance if: 1. Seed inocculated 2. pH above 6.5 3. P and K adequate

PHOSPHORUS REQUIREMENT

	BERMUDA		BERMUDA AND SMALL GRAINS		BERMUDA AND LEGUMES		ALFALFA	
Soil Test lbs/A	Percent Sufficiency	P_2O_5 lbs/A	Percent Sufficiency	P_2O_5 lbs/A	Percent Sufficiency	P_2O_5 lbs/A	Percent Sufficiency	P_2O_5 lbs/A
0-10	50	60-75	40	60-80	50	60-75	20	150-200
11-20	65	40-60	55	40-60	65	40-60	50	100-150
21-40	80	20-40	70	20-40	80	20-40	70	60-100
41-65	95	10-20	85	10-20	95	10-20	90	40-60
65+	100	none	100	none	100	none	100	none

POTASSIUM REQUIREMENT

	BERMUDA		BERMUDA AND SMALL GRAINS		BERMUDA AND LEGUMES		ALFALFA	
Soil Test lbs/A	Percent Sufficiency	K_2O lbs/A	Percent Sufficiency	K_2O lbs/A	Percent Sufficiency	K_2O lbs/A	Percent Sufficiency	K_2O lbs/A
0-75	50	60-80	50	60-80	50	60-80	20	180-240
76-125	65	40-60	65	40-60	65	40-60	50	120-180
126-200	80	20-40	80	20-40	80	20-40	70	80-120
201-250	95	15-20	95	15-20	95	15-20	90	40-80
250+	100	none	100	none	100	none	100	20-40 Unless soil test exceeds 350

Interpretation of Secondary Micronutrient Soil Tests

Soil Test Value	Deficiency Level[7]
ppm Zinc	
0—0.5	Low
.51—1.0	Marginal
1.0+	Adequate
ppm Iron	
0—2.0	Low
2.1—4.5	Marginal
4.5+	Adequate
0—10.0	Deficient for lawns
10.0+	Adequate for Lawns

Soil Test Value	Deficiency Level[7]
ppm Manganese	
0—1.0	Low
1.0+	Adequate
ppm Boron	
0—.25	Low
.26—.50	Marginal
.50+	Adequate

Calcium and Magnesium

The ratio of calcium to magnesium should not exceed 15. If it does, magnesium could be deficient.

Notes:

[1] If a nitrate test is available at the time of planting or at the time growth is initiated in the case of perennials, the nitrate-nitrogen can be subtracted from the nitrogen requirement.

[2] From 15-25 pounds of additional nitrogen is required when a large amount of fall growth is obtained.

[3] Additional 20 pounds of nitrogen required for heavy straw residue from previous crop or if the stubble mulch method of tillage is used.

[4] Wheat following alfalfa generally needs no nitrogen for 2 years.

[5] Split N application.

[6] For sudans and sorghum sudans. 50-60 lbs. of N per cutting or every 5-6 weeks if grazed.

[7] The deficiency levels are for the most sensitive field crop. The zinc levels are for corn, however pecan trees are more sensitive. The iron levels are for sorghum. Boron levels are for legumes, particularly peanuts and alfalfa. To date, none of the soils tested in the Central Laboratory here fallen below 1.0 ppm manganese. Only a few soils have been found to contain more than 15 times as much calcium as magnesium.

[8] Gypsum may be desirable for peanuts. Usually 300 to 750 lbs./A is applied over the middle during early bloom stage. Apply according to soil test below.

Soil Test % Ca Saturation	Gypsum needed (lbs/A)
10	750
20	500
30	400
40	300
50	none
60	none

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LIME REQUIREMENT

The following steps should be considered in making a lime recommendation.

1. A buffer index reading will be determined on all soils having a pH of 6.5 or less.
2. Refer to the table below for the lime requirement for each buffer index.
3. If the pH of the soil is less than 6.2, a minimum of 2 tons/A of agricultural limestone should be applied to alfalfa regardless of the buffer index. If the buffer index indicates a need for more than 2 tons/A, the higher rate should be applied.
4. Usually, due to the economics of application cost, it is not feasible to apply less than 2 tons/A.
5. When the recommended rate exceeds 5 tons/A, the application should be split to facilitate spreading and mixing with the soil. No more than 4 tons/A of limestone should be applied to established alfalfa or pastures at any one time.

Lime Required to Bring Soil to an Indicated pH According to Soil-buffer Index (Neutralization of 6-7 inch furrow slice).

Soil-buffer Index	Lime required to bring soil to indicated pH (tons/A).					
	Pure $CaCO_3$*			Agricultural Limestone** (nearest ½ ton)		
	7.2	6.8	6.4	7.2	6.8	6.4
Over 7.1	.5	none	none	1.0	none	none
7.1	.7	.5	none	1.0	1.0	none
7.0	1.0	.7	none	1.5	1.0	none
6.9	1.2	1.0	none	2.0	1.5	none
6.8	1.4	1.2	.7	2.5	2.0	1.0
6.7	1.6	1.4	1.2	3.0	2.5	2.0
6.6	2.1	1.9	1.7	3.5	3.0	3.0
6.5	2.8	2.5	2.2	4.5	4.0	3.5
6.4	3.5	3.1	2.7	6.0	5.0	4.5
6.3	4.2	3.7	3.2	7.0	6.0	5.5
6.2	4.7	4.2	3.7	8.0	7.0	6.0
6.1	5.2	4.8	4.2	8.5	8.0	7.0
6.0	5.9	5.4	4.7	9.5	9.0	8.0

*Pure $CaCO_3$ ground fine enough to be 100% effective.

**Agricultural ground limestone that is 60% effective. This is slightly above the specifications required for full REAP payment.

pH Preference of Farm Crops and Grains

LEGUMES	Suggested pH Range	pH Tolerance	NON-LEGUMES	Suggested pH Range	pH Tolerance
Alfalfa	6.5-7.5	6.0-8.0	Barley	6.5-7.0	5.5-9.0
Alsike Clover	6.0-7.0	5.0-8.0	Buckwheat	5.25-6.5	4.0-7.0
Cowpeas	5.5-7.0	5.0-8.0	Corn	5.5-7.0	5.0-7.5
Crimson Clover	5.5-7.0	5.0-8.0	Cotton	5.5-6.75	4.5-8.5
Red Clover	6.0-7.0	5.5-8.0	Oats	5.5-7.0	5.0-7.5
Rye	5.5-7.0	4.5-7.5	Sorghum	5.5-7.0	5.0-8.5
Soybeans	5.5-7.0	5.0-8.0	Wheat	5.5-7.0	5.0-8.5
Sweet Clover	6.5-7.5	6.0-9.0	Bermuda	6.0-7.0	5.0-9.0
Vetch	5.5-6.75	5.0-7.5	Fesque	4.5-7.0	4.0-8.0
White Clover (Ladino)	6.0-7.0	5.5-8.0	Sudan Grass	5.5-7.0	5.0-8.5

The pH preference of other plants may be obtained from Fact Sheet No. 2212.

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, J. C. Evans, Vice President for Extension, Director of Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma.
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FERTILIZERS
UNIT I

ASSIGNMENT SHEET #4--COMPLETE A SOIL ANALYSIS FORM

Secure a soil sample and answer the necessary information concerning the crop to be grown and the cropping history of the plot. Have the sample analyzed and recommend the fertilizer to use and the amount. When completed, return to instructor for evaluation and discussion purposes.

Soil & Water Laboratory
Agronomy Department

Oklahoma State University Extension
Stillwater, Oklahoma 74074

Sender's Sample No.______________ State Lab No.______________

County ______________ Farm No.______________ Field No.____________ Acres____________

Name______________________________ Address______________________________

Sample Location____

Soil is: (circle one in each column)

Level	Not eroded	Upland	Sand	Deep
Gently sloping	Eroded	Bench	Sandy loam	Moderately deep
Rolling	Severely eroded	Bottom	Loam	Shallow
			Clay	Very shallow

CROP HISTORY **FERTILIZER HISTORY**

Last Year____________ Yield____________ Kind & Amt. of Fert.____________________

2 Years Back____________ Yield____________ Kind & Amt. of Fert.____________________

3 Years Back____________ Yield____________ Kind & Amt. of Fert.____________________

Lime Used
When?____________________ How Much?______________________________

Circle one

Dryland Irrigated (ample water) Irrigated-limited water

Crop to be grown____________________________ Yield Goal ____________________

Production Problems____

ANALYSES		RECOMMENDATION	
Soil pH		Lime	
Buffer Index			
% O. M.		N	
Nitrate (surf)			
Nitrate (sub)			
Phosphorus		P_2O_5	
Potassium		K_2O	
Calcium		Ca	
Magnesium		Mg	
Iron		Fe	
Zinc		Zn	
Manganese		Mn	
Boron		B	
Other			

Remarks:____

FERTILIZERS
UNIT I

ASSIGNMENT SHEET #5--CALCULATE COST PER POUND OF NITROGEN FOR DIFFERENT FERTILIZER ANALYSES

Compare the cost per pound of actual nitrogen for each fertilizer. When you have completed the problems, turn in to your instructor for evaluation. Ask instructor for the local price per ton of each analysis.

1. Ammonium nitrate 33.0% Local price per ton ________

2. Anhydrous ammonia 82.0% Local price per ton ________

3, Urea 45.0% Local price per ton ________

4. Ammonium sulfate 21.0% Local price per ton ________

FERTILIZERS
UNIT I

ASSIGNMENT SHEET #6--CALCULATE APPLICATION RATES OF FERTILIZERS

Calculate the amount of nutrients needed using the different fertilizer analyses. When completed, return to instructor for evaluation.

1. A farmer desires to plant wheat with a 0-20-0 analysis at a rate of 100 lbs per acre. How many pounds of fertilizer would be needed?

2. How many pounds of 0-0-60 would be needed to apply 40 lbs of K_2O per acre?

3. How many pounds of 82-0-0 would be needed to apply 100 lbs of N per acre?

FERTILIZERS
UNIT I

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1--Evaluated to the satisfaction of the instructor

Assignment Sheet #2

1. 10 lbs nitrogen
   20 lbs phosphorus (P_2O_5)
   10 lbs potassium (K_2O)
2. 82 lbs nitrogen
   0 lbs phosphorus (P_2O_5)
   0 lbs potassium (K_2O)
3. 18 lbs nitrogen
   46 lbs phosphorus (P_2O_5)
   0 lbs potassium (K_2O)
4. 13 lbs nitrogen
   0 lbs phosphorus (P_2O_5)
   44 lbs potassium (K_2O)

Assignment Sheet #3

1. Wheat crop
   Lime - none
   Nitrogen - 50 lbs
   Phosphorus - 40 to 60 lbs
   Potassium - none
2. Peanut crop
   Lime - None
   Nitrogen - 10 to 20 lbs starter fertilizer
   Phosphorus - None
   Potassium - None

3. Soybean crop

Lime - None

Nitrogen - 10 to 20 lbs starter fertilizer plus inoculated seed

Phosphorus - 20 to 30 lbs

Potassium - 40 to 60 lbs

Assignment Sheet #4--Evaluated to the satisfaction of the instructor

Assignment Sheet #5--Evaluated to the satisfaction of the instructor

Assignment Sheet #6

1. 500 lbs
2. 66.67 lbs
3. 122 lbs

FERTILIZERS
UNIT I

TEST

NAME_______________________________SCORE_______________________

1. Match the terms on the right to the correct definitions. (Answers to "a" through "l" are on this page.)

_____a. Natural, manufactured, or processed material or mixture of materials that contains one or more of the recognized plant food elements; available in dry, liquid, or gas form

_____b. Proportion of nitrogen, phosphate, and potash in a fertilizer

_____c. Mixture of two or more carriers

_____d. Fertilizer containing only one nutrient

_____e. Quantity and grade of materials used in making a fertilizer mixture

_____f. Total of the fertilizer analysis

_____g. Percent content of total nitrogen (N), phosphorus (P) expressed as P_2O_5, and water-soluble potassium (K) expressed as K_2O available in the fertilizer

_____h. Trademark of the company which produced the fertilizer

_____i. Fertilizer which supplies all three of the major nutrients

_____j. Material which does not contain N, P_2O_5, or K and is added for weight to the fertilizer

_____k. Soil having an acid reaction because the pH is below 7.0

_____l. Soil having a basic reaction because the pH is above 7.0

1. Acid soil
2. Ratio
3. Filler
4. Carrier
5. Analysis
6. Complete fertilizer
7. Alkaline soil
8. Brand
9. Grade
10. Formula
11. Mixed fertilizer
12. Fertilizer

_____m. Soil that contains enough exchangeable sodium to adversely affect the growth of most crops

_____n. Yield obtained for a given cropping situation when all nutrients are adequate

_____o. Soil containing 20% or more organic matter

_____p. Percent of the yield possibility obtained because of the deficiency of a plant nutrient

_____q. Degree of acidity or alkalinity of the soil

13. Yield possibility
14. pH
15. Alkali
16. Organic soil
17. Percent sufficiency

2. Select from the following list factors that influence the use of fertilizers.

_____a. Chemical condition of soil

_____b. Crops

_____c. Physical condition of soil

_____d. Insects and diseases

_____e. Climatic conditions

_____f. Time

3. Match the major (primary) plant nutrients on the right to the correct characteristics.

_____a. Is part of every living cell; gives dark green color to chlorophyl molecule; aids and promotes seed development; increases protein and yields; promotes rapid growth; is easily translocated

_____b. Is part of every living cell; contributes to early maturing crops; is necessary for seed formation; stimulates root growth; is easily translocated

_____c. Is necessary for production and translocation of carbohydrates; produces plumper seed; controls water intake and respiration; promotes health and vigor of plants; stiffens straw and stalks; is easily translocated

1. Potassium
2. Phosphorus
3. Nitrogen

4. Match the minor (secondary) plant nutrients on the right to the correct characteristics.

_____a. Speeds decay of organic matter; stimulates formation of nitrates; promotes root and leaf growth; is necessary for nodulation of legumes

_____b. Is necessary for chlorophyl or green coloring; increases absorption of phosphorus; aids in formation of fats and oils; is important in plant enzyme system

_____c. Is necessary for nodule formation on legumes; is associated with plant enzyme systems; is easily translocated

1. Magnesium
2. Sulfur
3. Calcium

5. Match the nutrients on the right to the correct deficiency symptoms.

_____a. Stunted and spindly; yellowish green foliage; older leaves affected first; leaf margins remain green

_____b. Stunted growth; abnormally green appearance; purple leaves in advanced stages; older leaves affected first

_____c. Shorter plants; general loss of green color; leaf margins affected first

_____d. General yellowing; older leaves affected first; reddish purple leaves in advanced stages, especially the leaf edges; veins remain green; leaves may curl downward

1. Potassium
2. Magnesium
3. Nitrogen
4. Phosphorus

6. Select from the following list the information that must be stamped on all fertilizer bags according to state law.

_____a. Net weight

_____b. Name, brand, or trademark

_____c. Price or cost per pound

_____d. Name and address of manufacturer

_____e. Analysis (guaranteed chemical composition)

7. Match the types of fertilizer analyses on the right to the correct descriptions.

_____a. Over 30% plant food

_____b. 20 to 30% plant food

_____c. Less than 20% plant food

1. High analysis
2. Ordinary analysis
3. Concentrated analysis

8. Match the types of fertilizers on the right to the correct descriptions.

_____a. Fertilizer made by dissolving the correct proportion of the solid plant food carriers in water or by neutralizing phosphoric acid with ammonia

_____b. Liquid fertilizer containing solid fertilizer materials which is dispersed under pressure and usually contains a higher analysis than clear liquid mixes

_____c. Granulated fertilizer made by combining selected plant food materials to obtain certain ratios and quantities of plant nutrients

1. Dry mixed
2. Gas
3. Liquid

9. List the percent nutrient value of each of the following fertilizers.

a. Nitrogen

_____1) Ammonium sulfate

_____2) Anhydrous ammonia

_____3) Urea

_____4) Ammonium nitrate

b. Phosphate

_____1) Phosphoric acid

_____2) Rock phosphate

_____3) Nitric phosphate

_____4) Concentrated superphosphate

_____5) Ammonium phosphate

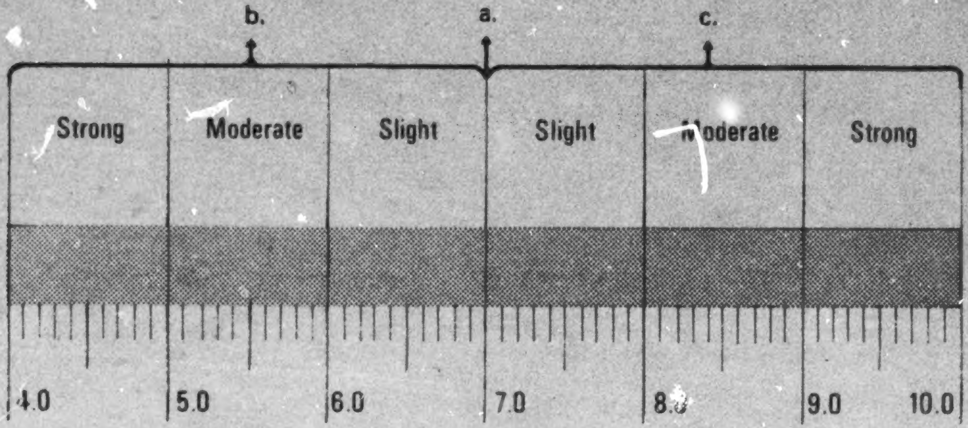
c. Potash (potassium)

_____1) Potassium sulfate

_____2) Potassium nitrate

_____3) Muriate of potash

10. Read the pH scale to determine if the soil is acid, neutral, or alkaline.



a. ______________________________

b. ______________________________

c. ______________________________

Suppose you were growing the following crops and soil test information was available on each field. Using the pH scale above, determine if the soil is acid, neutral, or alkaline.

d. Alfalfa soil test 5.5 ______________

e. Corn soil test 7.2 ______________

f. Wheat soil test 7.0 ______________

g. Sorghum soil test 8.2 ______________

11. Name three ways liming benefits plant growth.

a. ______________________________

b. ______________________________

c. ______________________________

12. Classify the plants listed below according to their desirable pH scale, strongly acid (STA), medium to moderately acid (M), or slightly acid to slightly alkaline (SLA). Place the correct letters in the blanks provided.

_____a. Alfalfa

_____b. Wheat

_____c. Peanuts

_____d. Cotton

_____e. Potatoes

_____f. Watermelons

_____g. Bermudagrass

_____h. Soybeans

_____i. Sweet clover

13. Name four factors to consider in caring for fertilizer equipment.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

14. Calculate the following nitrogen problems.

a. Suppose you were using ammonium nitrate which is 33.0 percent nitrogen and costs $122.00 per ton. What would it cost you per pound?

b. Suppose you were using anhydrous ammonia which is 82.0 percent nitrogen and costs $160.00 per ton. What would it cost you per pound?

15. Calculate the following fertilizer problem to determine fertilizer application rate.

Using the following soil test information and a sorghum crop with a yield of 4000 pounds per acre, what would be your fertilizer recommendation for the following field? The soil test revealed a pH of 6.4 lime, 40 lbs of nitrogen, 10 lbs of phosphorus, and 250+ lbs of potassium.

a. Nitrogen--____________________________

b. Phosphorus--____________________________

c. Potassium--____________________________

NITROGEN REQUIREMENT

SMALL GRAIN[1,2,3,4]		GRAIN SORGHUM[1]		CORN (Grain)[1]		COTTON[1]	
Yield Goal Bu/A	N lbs/A	Yield Goal lbs/A	N lbs/A	Yield Goal Bu/A	N lbs/A	Yield Goal lbs/A	N lbs/A
10	0	1800	0	50	80	200	0
15	0	2600	20	75	120	300	20
20	10	3300	40	100	160	400	30
25	20	4000	60	125	200	500	40
30	30	4700	80	150	240	600	50
35	40	5400	100	175	300	700	60
40	50	6000	120	200	380	800	70
45	60	6500	140			900	80
50	85	6900	155			1000	90
55	100	7200	170			1100	100
60	115	7500	180			1200	110
		8000	200			1300	120
		8500	220			1400	130
		9000	260			1500	140
		9500	320				
		10000	360				

PHOSPHORUS REQUIREMENT

	SMALL GRAINS		GRAIN SORGHUM		CORN (Grain)		COTTON	
Soil Test lbs/A	Percent Sufficiency	P_2O_5 lbs/A	Percent Sufficiency	P_2O_5 lbs/A	Percent Sufficiency	P_2O_5 lbs/A	Percent Sufficiency	P_2O_5 lbs/A
0-10	25	60-80	40	50-60	30	60-80	55	60-75
11-20	45	40-60	60	40-50	60	40-60	70	45-60
21-40	80	20-40	80	20-40	80	20-40	85	30-45
41-65	90	starter	95	starter	95	starter	95	20-30
65+	100	none	100	none	100	none	100	none

POTASSIUM REQUIREMENT

	SMALL GRAINS		GRAIN SORGHUM		CORN (Grain)		COTTON	
Soil Test lbs/A	Percent Sufficiency	K_2O lbs/A	Percent Sufficiency	K_2O lbs/A	Percent Sufficiency	K_2O lbs/A	Percent Sufficiency	K_2O lbs/A
0-75	50	50-60	40	75-100	40	80-120	40	80-110
76-125	70	40-50	65	50-75	60	60-80	60	60-80
126-200	80	20-40	80	30-50	75	40-60	75	40-60
201-250	95	15-20	95	20-30	90	20-40	90	20-40
250+	100	none	100	0-20	100	none	100	0-20

16. Collect plants with fertilizer deficiencies.

17. Calculate number of pounds of actual nitrogen, phosphorus, and potassium available from different fertilizer analyses.

18. Make fertilizer recommendations.

19. Complete a soil analysis form.

(NOTE: If activities 16-19 have not been accomplished prior to the test, ask the instructor when they should be completed.)

FERTILIZERS
UNIT I

ANSWERS TO TEST

1. a. 12
    - b. 2
    - c. 11
    - d. 4
    - e. 10
    - f. 9
    - g. 5
    - h. 8
    - i. 6
    - j. 3
    - k. 1
    - l. 7
    - m. 15
    - n. 13
    - o. 16
    - p. 17
    - q. 14
2. a, b, c, d, e, f
3. a. 3
    - b. 2
    - c. 1
4. a. 3
    - b. 1
    - c. 2

5. a. 3
   b. 4
   c. 1
   d. 2

6. a, b, d, e

7. a. 3
   b. 1
   c. 2

8. a. 3
   b. 2
   c. 1

9. a. 1) 21%
      2) 82%
      3) 45%
      4) 33%
   b. 1) 50-54%
      2) 30-34%
      3) 10-20%
      4) 44-48%
      5) 35-50%
   c. 1) 50-53%
      2) 44-46%
      3) 60-63%

10. a. Neutral
    b. Acid
    c. Alkaline
    d. Acid

e. Alkaline

f. Neutral

g. Alkaline

11. Any three of the following:

a. Corrects soil acidity

b. Reduces solubility of toxic elements

c. Supplies calcium and magnesium

d. Improves biological activity

e. Improves physical condition of soil

f. Makes fertilizers more effective and efficient

g. Improves yields

12. a. SLA

b. M

c. M

d. M

e. STA

f. STA

g. M

h. M

i. SLA

13. Any four of the following:

a. Remove all fertilizer from hopper after use

b. Clean hopper thoroughly with water

c. Allow hopper to dry

d. Clean out auger

e. Apply a mixture of 50% kerosene and oil to hopper

14. a. 18.48 cents/pound or 19 cents/pound
    b. 9.76 cents/pound or 10 cents/pound
15. a. Nitrogen 20 lbs
    b. Phosphorus 50 to 60 lbs
    c. Potassium 20 lbs
16. Evaluated to satisfaction of the instructor
17. Evaluated to satisfaction of the instructor
18. Evaluated to satisfaction of the instructor
19. Evaluated to satisfaction of the instructor

IMPROVING NATIVE RANGELAND
UNIT II

UNIT OBJECTIVE

After completion of this unit, the student should be able to survey native rangeland and determine the kind of site, degree of utilization, and the indication of range conditions. The student should be able to identify rangeland plants and recommend control practices. This knowledge will be evidenced by completion of the assignment sheets and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with rangeland to the correct definitions.
2. Select from a list factors that affect forage growth.
3. Select from a list practices to follow in order to better utilize grazing of rangeland.
4. Select from a list principles of range management.
5. Discuss in a short paragraph the meaning of *animal unit*.
6. Distinguish between grasses according to their palatability.
7. Complete a chart listing characteristics of native grasses.
8. Select from a list ways to prevent overgrazing.
9. Match the grazing systems to the correct descriptions.
10. Match kinds of range sites to the correct descriptions.
11. Match degrees of pasture utilization to the correct descriptions.
12. Match range conditons to the correct descriptions.
13. Identify collected rangeland plants.
14. Survey a native rangeland to determine kind of site, degree of utilization, and range condition and to recommend control practices for improving the productivity of the range.

IMPROVING NATIVE RANGELAND
UNIT II

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

   A. Provide student with objective sheet.

   B. Provide student with information and assignment sheets.

   C. Discuss unit and specific objectives.

   D. Discuss information sheet.

   E. Show slides of native range plants.

   F. Arrange field trip prior to class to allow students an opportunity to collect and identify rangeland plants and to survey native rangeland.

   G. Collect and mount twenty-five native range plants common to school area.

   H. Have student design and construct native rangeland plant boards for local and county fairs.

   I. Give test.

II. Instructional materials:

   A. Objective sheet

   B. Information sheet

   C. Assignment sheets

      1. Assignment Sheet #1--Identify Collected Rangeland Plants

      2. Assignment Sheet #2--Survey Native Rangeland

   D. Test

   E. Answers to test

III. Unit references:

   A. McVickar, M. H., and McVickar, J. S. *Approved Practices in Pasture Management.* 2d ed. Danville, Illinois: The Interstate Printers and Publishers, Inc., 1963.

   B. Donahue, Roy L. *Our Soils and Their Management.* 3d ed. Danville, Illinois: The Interstate Printers and Publishers, Inc., 1970.

C. Romann, Loren et al. *Pasture and Range Judging with Range Plant Identification in Oklahoma*. Stillwater: Oklahoma State University, 1976.

D. Romann, Loren; Rider, Allen; and Armbruster, Steve. "Seven Grazing Plans." *OSU Extension Facts*, no. 2567. Stillwater: Oklahoma State University, n.d.

E. Greer, Howard A. L., and Stritzke, Jim. "Woody Plant Control for Grassland Improvement." *OSU Extension Facts*, no. 2754. Stillwater: Oklahoma State University, n.d.

IV. Additional materials:

A. "Range and Forage Plants."

(NOTE: This set of nineteen slides with script can be used to teach identification of plants. The set is available from the Curriculum and Instructional Materials Center, State Department of Vocational and Technical Education, 1515 West Sixth Avenue, Stillwater, OK 74074.)

B. *Pasture and Range Plants*. Bartlesville, Oklahoma: Phillips Petroleum Co., 1963.

IMPROVING NATIVE RANGELAND
UNIT II

INFORMATION SHEET

I. Terms and definitions

   A. Warm-season plant--Plant which grows during the summer and early fall

   B. Cool-season plant--Plant which grows during the fall, winter, or spring

   C. Range--Extensive area of natural pastureland

   D. Native plant--Plant originating in North America

   E. Introduced plant--Plant brought from countries outside the United States

   F. Decreaser--Plant that decreases on a range when exposed to heavy grazing pressures

   G. Increaser--Plant that increases on a range when decreasers are reduced

   H. Invader--Plant which comes into a range after both increasers and decreasers have been reduced

   I. Grazing value--Worth of a plant for livestock production

   J. Range condition--State of health of rangeland

   K. Site--Area of land having a combination of climatic, topographic, and natural biotic factors significantly different from adjacent areas

   L. Palatable--Pleasant to animal's taste

   M. Climax--Plant native to area

II. Factors affecting forage growth

   A. Rainfall

   B. Sunlight

   C. Temperature

   D. Nutrients in the soil

   E. Texture of soil

   F. Structure of soil

   G. Topography

INFORMATION SHEET

III. Factors that better utilize grazing of rangeland

- A. Cross-fenced to control grazing
- B. Adequate and well-placed water supplies
- C. Salt licks located at each water hole
- D. Management of native forage

(NOTE: Controlled burning can be a useful range improvement tool in special situations and only when you have had too much grass the previous year. Annual burning is not recommended. The application of fertilizer has definitely shown an increased tonnage, but there is a question as to whether it is economical.)

IV. Principles of range management

- A. Manage according to growth habits and palatability for livestock
- B. Select proper grass

  (NOTE: Apply a mixture of legumes to pasture.)

- C. Let pastures rest
- D. Protect against overgrazing palatable grasses
- E. Protect against overgrazing just prior to and at seeding time

  (NOTE: Overgrazing will destroy the root supply, decrease the food supply available for new growth the following year, pack the ground, and reduce water intake.)

- F. Prevent erosion
- G. Protect against uncontrolled burning
- H. Practice brush and weed control

  (NOTE: There are four common methods of controlling weeds and brush, including mechanical clearing, mowing, burning, and the use of herbicides. Using herbicides is the most selective and most economical method, while mechanical clearing is the most expensive method and must be used on land where erosion is not a problem.)

V. Animal unit--Equal to a 1000-pound cow and calf which will consume approximately 30 pounds of dry grass per day

INFORMATION SHEET

VI. Palatability of grasses

A. Very palatable

1. Big bluestem
2. Switchgrass
3. Indiangrass
4. Little bluestem

(NOTE: These four grasses make up what is known as the "big four" of the tall grass prairie.)

B. Palatable

1. Sideoats grama
2. Hairy grama
3 Blue grama
4. Buffalograss

C. Less palatable

1. Broomsedge bluestem
2. Annual threeawn

(NOTE: In a climax change due to overgrazing, the tall grasses are first to leave, short grasses are second to leave, weeds are third to leave, and shrubs will be the last to leave range conditions.)

INFORMATION SHEET

VII. Native grass and characteristics

	Perennial	Annual	Cool Season	Warm Season	Native	Introduced	Climax		Invader	Grazing Value		
							Decreaser	Increaser		Good	Fair	Poor
Little bluestem	X			X	X		X			X		
Big bluestem	X			X	X		X			X		
Indiangrass	X			X	X		X			X		
Switchgrass	X			X	X		X			X		
Johnsongrass	X			X		X				X		
Sideoats grama	X			X	X			X		X		
Hairy grama	X			X	X			X			X	
Blue grama	X			X	X			X		X		
Buffalograss	X			X	X			X		X		
Wildindigo	X			X	X			X				X
Illinois bundleflower	X			X	X		X			X		
Wildrye	X		X		X		X			X		
Bermudagrass	X			X		X				X		
Weeping lovegrass	X			X		X					X	
Annual brome (Cheat)		X	X			X					X	
Sudangrass		X		X	X	X				X		
Scribner panicum	X		X		X			X			X	
Crabgrass		X		X					X			
Foxtail		X		X								
Western ragweed	X			X	X	X			X			X
Fescue	X		X			X	X			X		

INFORMATION SHEET

VIII. Prevention of overgrazing

A. Rotate pastures

B. Graze lightly during seed production seasons

C. Regulate animal units

(NOTE: When cattle graze, the first parts of the plant they remove are the stem and bud. This causes lateral branching which produces new growth. It is recommended that fifty percent of a plant be removed and fifty percent be left because heavily grazed plants lose vigor and die.)

IX. Grazing systems

A. Continuous grazing--Practice of leaving cattle on the range for a twelve-month period

(NOTE: The major problem with continuous grazing of a pasture is spot grazing.)

B. Rotation--Use of two, three, or more pastures so livestock can be concentrated in one area to graze forage to a uniform height in a short period of time and then be moved to another pasture

(NOTE: There are three other types of rotation grazing--creep grazing for calves, strip grazing, and first and last grazers. Creep grazing for calves allows them to have access to certain areas from which cows are restricted. Strip grazing uses two portable fences to allot a small area of the pasture to be grazed for a short period of time. First and last grazers involves the use of two groups of livestock. First grazers are allotted to a pasture and left there until one-half or less of the available forage is utilized. Then first grazers are moved and last grazers are brought in to clean up the remaining forage.)

C. Stockpiling forage--Accumulation of forage in the field during periods of good growth for use during periods of little or no growth

X. Kinds of range sites

A. Bottomland--Soil located along creeks and rivers; subject to overflow; very productive and capable of producing large amounts of forage plants such as little bluestem, big bluestem, switchgrass, and indiangrass

(NOTE: Grasses such as sideoats grama, blue grama, buffalograss, and others would be considered increasers if found growing on this location.)

INFORMATION SHEET

B. Loamy or sandy prairie--Loamy or sandy textured soil with good, deep subsoil which supports highly productive main grasses such as little bluestem, big bluestem, indiangrass, switchgrass, sideoats grama, blue grama, and buffalograss

C. Savannah or rocky savannah--Vegetative area between forest and prairie grassland with some scattered trees and native grasses

(NOTE: The grasses grown on this site are little bluestem, big bluestem, indiangrass, switchgrass, and some increasers such as sideoats grama and tall dropseed.)

D. Deep sand--Soil with coarse texture that takes water readily with woody shrubs and tall grasses

E. Hard land or claypan prairie--Soil with medium or fine textured top soil and moderate or deep subsoil; sites are nearly level to gently sloping upland

F. Very shallow or rocky--Soil less than 10 inches deep and very rocky and rough; production very low and will not stand heavy grazing

(NOTE: Short, mid, and tall grasses are found growing on these areas.)

G. Steep slopes or ridges--Steep, rough, shallow land; very low production

(NOTE: Short and mid grasses are found growing on these areas.)

H. Red clay prairie--Soil red in color with rolling and broken topography and some gentle slopes which support such grasses as buffalograss, blue grama, hairy grama, big bluestem, indiangrass, little bluestem, and switchgrass

I. Rough broken or breaks--Range areas which are rough and broken by steep slopes, canyons, or gullies; not easily accessible to livestock

XI. Degrees of pasture utilization

A. Unused--No livestock use

B. Light--Only best plants grazed

C. Proper--Uniform grazing of range

D. Severe--Hedged appearance of shrubs and trampling damage

E. Destructive--Death of primary species; only remnants of good plants surviving

INFORMATION SHEET

XII. Range conditions

A. Excellent--76 to 100 percent of the vegetation is a mixture of highly palatable and desirable plants

B. Good--51 to 75 percent of the original vegetation is a mixture of highly palatable and desirable perennial plants

C. Fair--26 to 50 percent of the original vegetation is a mixture of highly palatable and desirable perennial plants

D. Poor--Less than 25 percent of all vegetation consists of highly palatable and desirable plants

IMPROVING NATIVE RANGELAND
UNIT III

ASSIGNMENT SHEET #1--IDENTIFY COLLECTED RANGELAND PLANTS

Collect as many rangeland plants as possible and identify each plant according to either perennial or annual; cool or warm season; decreaser, increaser, or invader; and good, fair, or poor grazing value. When finished, turn in to your instructor for evaluation.

Place an "X" in the blanks indicating the proper identification for each plant.

							Climax			Grazing Value		
	Perennial	Annual	Cool Season	Warm Season	Native	Introduced	Decreaser	Increaser	Invader	Good	Fair	Poor

IMPROVING NATIVE RANGELAND
UNIT III

ASSIGNMENT SHEET #2--SURVEY NATIVE RANGELAND

Survey a native rangeland and determine the kind of site and degree of utilization and indicate range condition. After performing each procedure, recommend control practices for improving the productivity of the range. When completed, turn in to your instructor for evaluation.

Place an "X" in each blank indicating your findings and recommendations.

Degree of Utilization

Grade

______ Unused
______ Light
______ Moderate
______ Close
______ Severe
______ Destructive

Kind of Range Site

______ Bottomland
______ Loamy or sandy prairie
______ Hardland or clay pan prairie
______ Very shallow or rocky
______ Savannah or rocky savannah
______ Very steep slopes or ridges
______ Red clay prairie
______ Deep sand or sandy savannah
______ Rough broken or breaks

ASSIGNMENT SHEET #2

Range Condition Class

______ Excellent		Name the Predominant	
______ Good	1.	Decreaser	____________________
______ Fair	2.	Increaser	____________________
______ Poor	3.	Invader	____________________

Range Management Practices

Check No.

______ 1. Use deferred grazing during growing season.

______ 2. Use moderate grazing during dormant season.

______ 3. Delay grazing in spring when range plants first emerge.

______ 4. Decrease rate of stocking.

______ 5. Apply flexible stocking in order to limit use to 50% of the year's growth.

______ 6. Use more livestock or a longer grazing season.

______ 7. Seed with adapted native grasses and defer grazing until stand is well established.

______ 8. Control invading grasses and forbs by grazing intensively for short periods during growing season.

______ 9. Protect from uncontrolled burning.

______ 10. Practice weed control.

______ 11. Apply brush and cactus control.

______ 12. Practice light stocking following spraying of weeds and brush.

IMPROVING NATIVE RANGELAND
UNIT II

TEST

NAME ______________________________ SCORE ______________

1. Match the terms on the right to the correct definitions.

______a. Plant that decreases on a range when exposed to heavy grazing pressures

______b. Plant which grows during the summer and early fall

______c. Worth of a plant for livestock production

______d. Extensive area of natural pastureland

______e. State of health of rangeland

______f. Area of land having a combination of climatic, topographic, and natural biotic factors significantly different from adjacent areas

______g. Plant that increases on a range when decreasers are reduced

______h. Plant originating in North America

______i. Plant which grows during the fall, winter, or spring

______j. Plant which comes into a range after both increasers and decreasers have been reduced

______k. Plant brought from countries outside the United States

______l. Pleasant to animal's taste

______m. Plant native to area

1. Site
2. Range condition
3. Grazing value
4. Invader
5. Increaser
6. Decreaser
7. Introduced plant
8. Native plant
9. Range
10. Climax
11. Warm-season plant
12. Palatable
13. Cool-season plant

2. Select from the following list factors that affect forage growth.

_____a. Temperature
_____b. Texture of soil
_____c. Rainfall
_____d. Structure of soil
_____e. Minerals in the air
_____f. Sunlight
_____g. Oxygen content in soil
_____h. Nutrients in the soil
_____i. Topography

3. Select from the following list practices to follow in order to better utilize grazing of rangeland.

_____a. Adequate and well-placed water supplies
_____b. Cross-fenced to control grazing
_____c. Salt licks located away from water hole
_____d. Management of native forage
_____e. Salt licks located at each water hole

4. Select from the following list five principles of range management.

_____a. Graze 75 percent top growth; leave 25 percent
_____b. Manage according to growth habits and palatability for livestock
_____c. Let pastures rest
_____d. Prevent erosion
_____e. Burn pastures
_____f. Practice brush and weed control
_____g. Protect against overgrazing palatable grasses

5. Discuss in a short paragraph the meaning of *animal unit*.

____

____

____

6. Distinguish between very palatable (V) grasses, palatable (P) grasses, and less palatable grasses (L) by placing the correct letters in the blanks provided.

_____a. Buffalograss

_____b. Switchgrass

_____c. Indiangrass

_____d. Hairy grama

_____e. Annual threeawn

_____f. Blue grama

_____g. Big bluestem

_____h. Sideoats grama

_____i. Little bluestem

_____j. Broomsedge bluestem

7. Complete the following chart by placing an "X" in the correct column according to whether the plant is a warm-season plant or a cool-season plant.

	Perennial	Annual	Cool Season	Warm Season	Native	Introduced	Climax		Invader	Grazing Value		
							Decreaser	Increaser		Good	Fair	Poor
Little bluestem												
Big bluestem												
Inidangrass												
Switchgrass												
Johnsongrass												
Sideoats grama												
Hairy grama												
Blue grama												
Buffalograss												
Wildindigo												
Illinois bundleflower												
Wildrye												
Bermudagrass												
Weeping lovegrass												
Annual brome (Cheat)												
Sudangrass												
Scribner panicum												
Crabgrass												
Foxtail												
Western ragweed												
Fescue												

8. Select from the following list ways to prevent overgrazing.

_____ a. Regulate animal units

_____ b. Rotate pastures

_____ c. Graze lightly during seed production seasons

_____ d. Graze lightly during growing season

9. Match the types of grazing systems on the right to the correct descriptions.

_____ a. Use of two, three, or more pastures so livestock can be concentrated in one area to graze forage to a uniform height in a short period of time and then be moved to another pasture

_____ b. Practice of leaving cattle on the range for a twelve-month period

_____ c. Accumulation of forage in the field during periods of good growth for use during periods of little or no growth

1. Rotation
2. Stockpiling forage
3. Continuous grazing

10. Match the kinds of range sites on the right to the correct descriptions.

_____ a. Steep, rough, shallow land; very low production

_____ b. Range areas which are rough and broken by steep slopes, canyons, or gullies; not easily accessible to livestock

_____ c. Soil located along creeks and rivers; subject to overflow; very productive and capable of producing large amounts of forage plants such as little bluestem, big bluestem, switchgrass, and indiangrass

_____ d. Soil red in color with rolling and broken topography and some gentle slopes which support such grasses as buffalograss, blue grama, hairy grama, big bluestem, indiangrass, little bluestem, and switchgrass

1. Bottomland
2. Steep slopes or ridges
3. Rough broken or breaks
4. Loamy or sandy prairie
5. Red clay prairie
6. Very shallow or rocky
7. Savannah or rocky savannah
8. Deep sand
9. Hard land or claypan prairie

_____e. Loamy or sandy textured soil with good, deep subsoil which supports highly productive main grasses such as little bluestem, big bluestem, indiangrass, switchgrass, sideoats grama, blue grama, and buffalograss

_____f. Soil less than 10 inches deep and very rocky and rough; production very low and will not stand heavy grazing

_____g. Vegetative area between forest and prairie grassland with some scattered trees and native grasses

_____h. Soil with medium or fine textured top soil and moderate or deep subsoil; sites are nearly level to gently sloping upland

_____i. Soil with coarse texture that takes water readily with woody shrubs and tall grasses

11. Match the degree of pasture use on the right to the correct descriptions.

_____a. Only best plants grazed

_____b. Death of primary species; only remnants of good plants surviving

_____c. Uniform grazing of range

_____d. No livestock use

_____e. Hedged appearance of shrubs and trampling damage

1. Unused
2. Light
3. Proper
4. Severe
5. Destructive

12. Match range conditions on the right to the correct descriptions.

_____a. 51 to 75 percent of the original vegetation is a mixture of highly palatable and desirable perennial plants

_____b. Less than 25 percent of all vegetation consists of highly palatable and desirable plants

_____c. 76 to 100 percent of the vegetation is a mixture of highly palatable and desirable plants

_____d. 26 to 50 percent of the original vegetation is a mixture of highly palatable and desirable perennial plants

1. Poor
2. Excellent
3. Good
4. Fair

13. Identify collected rangeland plants.

14. Survey a native rangeland to determine kind of site, degree of utilization, and range condition and to recommend control practices for improving the productivity of the range.

(NOTE: If activities 13 and 14 have not been accomplished prior to the test, ask the instructor when they should be completed.)

IMPROVING NATIVE RANGELAND
UNIT II

ANSWERS TO TEST

1.
   a. 6
   b. 11
   c. 3
   d. 9
   e. 2
   f. 1
   g. 5
   h. 8
   i. 13
   j. 4
   k. 7
   l. 12
   m. 10

2. a, b, c, d, f, h, i

3. a, b, d, e

4. b, c, d, f, g

5. Discussion should include:

   An animal unit is equal to a 1000-pound cow and calf which will consume approximately 30 pounds of dry grass per day

6.
   a. [illegible]
   b. V
   c. V
   d. P
   e. L
   f. P
   g. V
   h. P
   i. V
   j. L

7.

	Perennial	Annual	Cool Season	Warm Season	Native	Introduced	Climax		Invader	Grazing Value		
							Decreaser	Increaser		Good	Fair	Poor
Little bluestem				X								
Big bluestem				X								
Inidangrass				X								
Switchgrass				X								
Johnsongrass				X								
Sideoats grama				X								
Hairy grama				X								
Blue grama				X								
Buffalograss				X								
Wildindigo				X								
Illinois bundleflower				X								
Wildrye			X									
Bermudagrass				X								
Weeping lovegrass				X								
Annual brome (Cheat)			X									
Sudangrass				X								
Scribner panicum			X									
Crabgrass				X								
Foxtail				X								
Western ragweed				X								
Fescue			X									

8. a, b, c

9. a. 1

b. 3

c. 2

10. a. 2

b. 3

c. 1

d. 5

e. 4

f. 6

g. 7

h. 9

i. 8

11. a. 2

b. 5

c. 3

d. 1

e. 4

12. a. 3
    b. 1
    c. 2
    d. 4
13. Evaluated to satisfaction of instructor
14. Evaluated to satisfaction of instructor

ESTABLISHING AND IMPROVING TAME PASTURES
UNIT III

UNIT OBJECTIVE

After completion of this unit, the student should be able to survey a farm and recommend the most desirable tame pasture plant to use to increase the production of forage growth. The student should be able to select the correct fertilizer and herbicide to use on the home farm and in the local community. This knowledge will be evidenced by completion of the assignment sheets and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with tame pastures to the correct definitions.
2. Select from a list advantages of tame pastures.
3. Select from a list steps to follow in preparing the ideal seedbed for pasture improvement.
4. Match alternative tame pasture plants with varieties of each.
5. Match the starter fertilizers to the types of pasture plants on which they should be applied.
6. Select from a list the proper fertilizer to use in top dressing tame pasture plants.
7. Match methods of weed and brush control with the correct descriptions.
8. Select from a list advantages of renovating pastureland.
9. Select methods to follow in order to increase production of forage growth.
10. Match herbicides to the type of weeds and brush controlled by each.
11. List functions of the county Agricultural Stabilization and Conservation Service (ASCS) in relation to the farming operation.
12. Survey a tame pasture to recommend improvement practices.

13. Survey a native rangeland.
14. Interpret policies of county ASCS office.
15. Calculate the cost of establishing a tame pasture program.

ESTABLISHING AND IMPROVING TAME PASTURES
UNIT III

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

  A. Provide student with objective sheet.

  B. Provide student with information and assignment sheets.

  C. Discuss unit and specific objectives.

  D. Discuss information sheet.

  E. Contact county ASCS office manager to act as resource person for class.

  F. Arrange field trip to survey a tame pasture and recommend improvement practices.

  G. Have student design and construct improved pasture plant board for class and local fair.

  H. Give test.

II. Instructional materials:

  A. Objective sheet

  B. Information sheet

  C. Assignment sheets

    1. Assignment Sheet #1--Survey a Tame Pasture to Recommend Improvement Practices

    2. Assignment Sheet #2--Survey a Native Rangeland

    3. Assignment Sheet #3--Interpret Policies of County ASCS Office

    4. Assignment Sheet #4--Calculate the Cost of Establishing a Tame Pasture Program

  D. Test

  E. Answers to test

III. Unit references:

A. McVickar, M. H., and McVickar, J. S. *Approved Practices in Pasture Management.* 2d ed. Danville, Illinois: The Interstate Printers and Publishers, Inc., 1963.

B. Donahue, Roy L. *Our Soils and Their Management.* 3rd ed. Danville, Illinois: The Interstate Printers and Publishers, Inc., 1970.

C. Romann, Loren M., and McMurphy, W. E. "Weeping Lovegrass." *OSU Extension Facts*, no. 2556. Stillwater: Oklahoma State University, n.d.

D. Greer, Howard A. L. "Mesquite Control in Oklahoma." *OSU Extension Facts*, no. 2760. Stillwater: Oklahoma State University, n.d.

E. Romann, Loren M., and McMurphy, W. E. "Tall Fescue Establishment and Management." *OSU Extension Facts*, no. 2559. Stillwater: Oklahoma State University, n.d.

F. Romann, Loren M.; McMurphy, W. E.; and Boyer, B. D. "Tall Fescue in Bermuda Grass." *OSU Extension Facts*, no. 2564. Stillwater: Oklahoma State University, n.d.

ESTABLISHING AND IMPROVING TAME PASTURES
UNIT III

INFORMATION SHEET

I. Terms and definitions

   A. Site--Area of land having a combination of climatic, topographic, and natural biological factors significantly different from adjacent areas

   B. Starter fertilizer--Fertilizer used before or at the time of planting to provide the proper amount of nutrients for beginning plants

   C. Subsoiling--Breaking of compact subsoils without turning them over, using a special narrow cultivator shovel or chisel

   D. Renovating--Practice of loosening the soil to allow freer movement of water and air and to control weeds

   E. Herbicide--Chemical developed to control weeds

II. Advantages of tame pasture

   A. Increases carrying capacity of land

   B. Increases rate of gain

   C. Allows overseeding with legumes, which prolongs grazing season

III. Seedbed preparation

   A. Remove trees and/or shrubs

   (NOTE: If trees are large, root plowing might become necessary.)

   B. Plow soil if weeds are a problem

   C. Use disc if soil is loose and not infested with weeds

   D. Use harrow or drag and level land

   E. Use roller to firm soil

IV. Tame pasture plants and varieties

   A. Bermudagrass

   (NOTE: This summer-growing perennial produces very little forage in Oklahoma before the first of May.)

      1. Common

      2. Hardy

INFORMATION SHEET

3. Coastal
4. Greenfield
5. Midland

   (NOTE: The midland variety of bermudagrass is tall growing and leafy when properly fertilized and managed.)

B. Lovegrass

(NOTE: Lovegrass is a summer-growing perennial which produces good forage and is usually ready for grazing four weeks before bermudagrass. It is best adapted to well-drained, sandy soils and is drought tolerant. Lovegrass starts growth earlier than bermudagrass. The root system can take advantage of deep soil moisture, while the shallow roots can take advantage of light rains. It is palatable if properly managed.)

1. Common weeping
2. Morpa weeping
3. Renner

   (NOTE: Renner lovegrass is not winter hardy in northern Oklahoma.)
4. Ermelo

C. Fescue

(NOTE: Fescue is a deep-rooted, perennial, cool-season grass adapted to a wide range of soil and climatic conditions. Fescue grows best on fertile, well-drained soils, but it also produces well on soils too wet for most other pasture grasses. Fescue in bermudagrass sod is a practical way to extend the grazing season of a bermuda pasture.)

1. Kentucky 31
2. Alta
3. Kenhy

   (NOTE: This variety is a hybrid cross between ryegrass and tall fescue.)

INFORMATION SHEET

D. Temporary pastures

1. Small grains

   (NOTE: Wheat, oats, barley, and rye are examples of small grains. Rye is the best small grain pasture crop available and can be combined with other small grains.)

2. Sudangrass and sudangrass hybrids

   (NOTE: Sudangrass may be used for grazing, silage, green chop, or hay production. Daily gains of stocker calves may be 1 lb or less on these forages, but it compensates with a stocking rate of three to five calves per acre.)

3. Crabgrass

   (NOTE: Crabgrass may be used to supplement early spring pasture.)

V. Starter fertilizers

A. Bermudagrass--10-20-10

B. Lovegrass--10-20-10

C. Fescue--20-20-20

(NOTE: Fertilizing at or near planting is very beneficial for promoting early stand development. All phases of growth, from tilling to early forage and seed production, are enhanced by proper starter fertilizer programs. Be sure to use soil test data before making the fertilizer recommendations.)

VI. Fertilizers for top dressing tame pasture plants

(NOTE: All top dressings should be applied according to pasture utilization, rainfall, and soil test information.)

A. Lovegrass--50 to 100 lbs actual nitrogen

   (NOTE: At least 50 lbs of actual nitrogen per acre should be applied in March, just before weeping lovegrass starts to grow. Subsequent nitrogen application of 50 lbs per acre after each harvest can be applied based on previous growth.)

B. Bermudagrass--50 to 100 lbs actual nitrogen

   (NOTE: Apply nitrogen no earlier than April 20 and then every four to five weeks, depending upon soil moisture conditions and grazing.)

INFORMATION SHEET

C. Fescue 50 to 100 lbs actual nitrogen

(NOTE: Fescue should be fertilized twice a year to receive maximum results, 50 to 75 lbs of actual nitrogen per acre in February and another 60 to 80 lbs of actual nitrogen in late August.)

VII. Methods of weed and brush control

A. Chemical--Removing by means of applying a selective herbicide

B. Mechanical--Removing by some type of mechanical practice such as mowing, plowing under, or burning

VIII. Advantages of renovating pastureland

A. Reduces competition of other plants

B. Provides for more available nutrients

C. Increases movement of air and water

IX. Methods to increase forage production

A. Overseed with inoculated legumes and small grains

(NOTE: Legumes serve as a companion crop, furnish nitrogen for the grass, and provide grazing value until pasture becomes established.)

B. Protect from overgrazing by pasture rotation

C. Fertilize regularly

(NOTE: All established, improved pastures need a regular fertilizer program to comply with the soil test information.)

D. Control weeds and brush

X. Herbicides for weed and brush control

(CAUTION: Be sure to read all labels and follow manufacturer's recommendations before applying.)

A. Weeds on bermudagrass

1. 2, 4-D--Apply when weeds are vigorously growing after sprigging for broadleaf weed control; 3/4 to 1 lb per acre

2. Karmex (diuron)--Use as a preemergence; apply after sprigging and before weeds emerge; use higher ratio on clay soils, 1.0 to 2.4 lbs per acre

INFORMATION SHEET

3. Princep (simazine)--Apply early in season before weeds germinate or apply to clean soil; 1 1/2 to 3 lbs per acre

B. Brush

1. Post and blackjack oaks--Apply 2, 4, 5-T; use from May 15 to July 10

2. Shinnery oak--Apply 2, 4, 5-T; use from May 15 to July 10

3. Buckbrush and willow--Apply 2, 4-D to buckbrush from April 20 to May 10 and on willows from May 15 to July 10

4. Persimmon--Apply 2, 4, 5-T or basal bark and injector treatments of undiluted Banvel; use about mid-June when leaves have fully expanded

5. Mesquite--Apply 2, 4, 5-T; apply 40 to 90 days after the first green growth appears at the bud

XI. ASCS functions

(NOTE: The Agricultural Stabilization and Conservation Service is operated by a committee elected from county participants.)

A. Establishes practices and policies for helping farmers and ranchers

B. Shares in cost of clearing land, establishing pastures, building ponds and terraces, and purchasing seeds, fertilizers, and agricultural lime

(NOTE: Instructor may add other practices common to the local community.)

ESTABLISHING AND IMPROVING TAME PASTURES
UNIT III

ASSIGNMENT SHEET #1--SURVEY A TAME PASTURE TO RECOMMEND IMPROVEMENT PRACTICES

Schedule a visit to a farm and survey the tame pasture. Answer each of the following questions based on your survey.

1. What is the approximate number of acres in the field? ____________
2. What is the most predominant vegetation? ____________
3. What is the condition of the vegetation? ____________
4. What type of livestock is utilizing the pasture? ____________
5. What is the number of head per acre presently utilizing the field?

   ____
6. Is there an abundance of legumes present with the tame pasture grasses? __________ If yes, what type of legume is present?

   ____
7. Does the pasture show indications of weeds and brush being a problem?

   ____

Using the information collected above, recommend practices for improvement of forage production. When completed, turn in to instructor for evaluation.

1. ____

   ____
2. ____

   ____
3. ____

   ____
4. ____

   ____

ESTABLISHING AND IMPROVING TAME PASTURES
UNIT III

ASSIGNMENT SHEET #2--SURVEY A NATIVE RANGELAND

Survey a native rangeland to determine the kind of site, degree of utilization, and the range condition. Place an "X" in each blank indicating your findings. Using this information and taking into consideration the topography of the land and the climatic condition, what type of tame pasture plant would you recommend? When completed, return to instructor for evaluation.

1. Kind of range site

_____ Bottomland

_____ Loamy or sandy prairie

_____ Hardland or clay pan prairie

_____ Very shallow or rocky

_____ Savannah or rocky savannah

_____ Very steep slopes or ridges

_____ Red clay prairie

_____ Deep sand or sandy savannah

_____ Rough broken or breaks

2. Degree of utilization

_____ Unused

_____ Light

_____ Moderate

_____ Close

_____ Severe

_____ Destructive

ASSIGNMENT SHEET #2

3. Range condition class

_____ Excellent

_____ Good

_____ Fair

_____ Poor

4. What is the average rainfall of area? ______________________________

5. What is the topography of the land? ______________________________

6. What type of tame pasture plant would you recommend for the area? Before you answer this question, you might wish to refer back to the information sheet.

ESTABLISHING AND IMPROVING TAME PASTURES
UNIT III

ASSIGNMENT SHEET #3--INTERPRET POLICIES OF COUNTY ASCS OFFICE

Every farmer or potential farmer should become acquainted with the programs and policies of the county ASCS office. Schedule a visit with the county official and answer the following questions. When completed, return to instructor for evaluation and for discussion purposes.

What is the minimum rate of cost-sharing on each of the following practices?

1. Sodding or sprigging ______________________
2. Seeding grasses or legumes
    a. Korean lespedeza ______________________
    b. Large hop clover ______________________
    c. Small hop clover ______________________
    d. Hairy vetch ______________________
    e. Weeping lovegrass ______________________

    (NOTE: Add others common to your area.)

    f. ______________________
    g. ______________________
    h. ______________________
3. Application of fertilizer ______________________
4. Application of agricultural limestone ______________________
5. Root plowing or undercutting ______________________
6. Application of herbicides ______________________

ESTABLISHING AND IMPROVING TAME PASTURES
UNIT III

ASSIGNMENT SHEET #4--CALCULATE THE COST OF ESTABLISHING A TAME PASTURE PROGRAM

Suppose you were a farmer and wanted to convert 40 acres of native rangeland into some type of tame pasture program. Approximately 20 acres of the 40 acres are covered with shinnery oak and blackjack. The soil test information revealed that you would need to apply 200 lbs of 10-20-10 fertilizer and need 2000 lbs of lime per acre. Using your local county ASCS programs, what would be the total cost of sprigging 40 acres of bermudagrass? (At this time you are not planning on overseeding.) Complete the work and turn in to the instructor for evaluation.

1. What will be the cost of removing the trees? ____________________

2. What was the cost of the fertilizer? ____________________

3. What was the cost of the sprigging? ____________________

4. What was the cost of the agricultural lime? ____________________

5. What will be the root plowing cost, if necessary? ____________________

6. What will be the cost of seedbed preparation? ____________________

ASSIGNMENT SHEET #4

7. What will be the total cost of sprigging the 40 acres? ________________

8. What percent of the total cost will be paid by the county ASCS? __________

9. If the county ASCS pays ____________ and the total cost involved in converting the 40 acres of rangeland into a tame pasture is ____________, what will be the cost to you as a farmer? ____________

10. What would be the carrying capacity of the improved pasture? __________

____

ESTABLISHING AND IMPROVING TAME PASTURES
UNIT III

TEST

NAME ________________________________ SCORE ____________________

1. Match the terms on the right to the correct definitions.

_____a. Breaking of compact subsoils without turning them over, using a special narrow cultivator shovel or chisel

_____b. Chemical developed to control weeds

_____c. Area of land having a combination of climatic, topographic, and natural biological factors significantly different from adjacent areas

_____d. Fertilizer used before or at the time of planting to provide the proper amount of nutrients for beginning plants

_____e. Practice of loosening the soil to allow freer movement of water and air and to control weeds

1. Site
2. Starter fertilizer
3. Renovating
4. Herbicide
5. Subsoiling

2. Select from the following list three advantages of a tame pasture.

_____a. Requires a lower degree of fertilization

_____b. Increases rate of gain

_____c. Allows overseeding with legumes, which prolongs grazing season

_____d. Decreases carrying capacity of pastures

_____e. Increases carrying capacity of land

3. Select from the following list steps to follow in preparing the ideal seedbed for pasture improvement.

_____a. Plow soil if weeds are a problem

_____b. Remove trees and/or shrubs

_____c. Use harrow or drag and level land ______d. Use roller to firm soil

______e. Use disc if soil is loose and not infested with weeds

4. Match the tame pasture plants on the right to the correct varieties.

______a. Morpa weeping

______b. Kentucky 31

______c. Midland

______d. Common

______e. Common weeping

______f. Sudangrass

______g. Kenhy

______h. Small grains

1. Bermudagrass
2. Lovegrass
3. Fescue
4. Temporary pastures

5. Match the starter fertilizers on the right to the type of pasture plants on which they should be applied. (Some answers may not be used.)

______a. Bermudagrass

______b. Fescue

______c. Lovegrass

1. 82-0-0
2. 10-20-10
3. 30-40-40
4. 20-20-20

6. Select from the list below the proper fertilizer to use in top dressing tame pasture plants.

______a. 25 to 50 lbs actual nitrogen

______b. 50 to 100 lbs actual nitrogen

______c. 100 to 150 lbs actual nitrogen

______d. 150 to 200 lbs actual nitrogen

7. Match the methods of weed and brush control on the right to the correct descriptions.

______a. Removing by means of applying a selective herbicide

______b. Removing by some type of mechanical practice such as mowing, plowing under, or burning

1. Chemical
2. Mechanical

8. Select from the following list advantages of renovating pastureland.

_____a. Decreases movement of air and water in soil

_____b. Provides for more available nutrients

_____c. Increases movement of air and water

_____d. Reduces competition of other plants

_____e. Increases sunlight to plants

9. Select from the following list methods to follow in order to increase forage growth.

_____a. Protect from overgrazing by pasture rotation

_____b. Control weeds and brush

_____c. Overseed with inoculated legumes and small grains

_____d. Fertilize regularly

10. Match the herbicides on the right to the weeds and brush controlled by each. (Answers may be used more than once. Some blanks may have more than one answer.)

_____a. Fescue pasture infested with persimmon

_____b. Lovegrass infested with mesquite

_____c. Bermudagrass infested with vigorously growing weeds following sprigging

1. 2, 4, 5-T
2. 2, 4-D
3. Banvel

11. List two functions of the county Agricultural Stabilization and Conservation Service (ASCS) in relation to the farming operation.

a. ____

____

b. ____

____

12. Survey a tame pasture to recommend improvement practices.

13. Survey a native rangeland.

14. Interpret policies of county ASCS office.

15. Calculate the cost of establishing a tame pasture program.

(NOTE: If activities 12-15 have not been accomplished prior to the test, ask the instructor when they should be completed.)

ESTABLISHING AND IMPROVING TAME PASTURES
UNIT III

ANSWERS TO TEST

1. a. 5
    b. 4
    c. 1
    d. 2
    e. 3
2. b, c, e
3. a, b, c, d, e
4. a. 2
    b. 3
    c. 1
    d. 1
    e. 2
    f. 4
    g. 3
    h. 4
5. a. 2
    b. 4
    c. 2
6. b
7. a. 1
    b. 2
8. b, c, d
9. a, b, c, d

10. a. 1 and 3
    b. 1
    c. 2

11. a. Establishes practices and policies for helping farmers and ranchers
    b. Shares in cost of clearing land, establishing pastures, building ponds and terraces, and purchasing seed, fertilizers, and agricultural lime

12. Evaluated to satisfaction of instructor

13. Evaluated to satisfaction of instructor

14. Evaluated to satisfaction of instructor

15. Evaluated to satisfaction of instructor

MARKETING CROPS
UNIT IV

UNIT OBJECTIVE

After completion of this unit, the student should be able to distinguish between supply and demand as related to the crop marketing industry and plot graphs indicating each. The student should be able to compare advantages and disadvantages of home storage versus commercial storage. The student should be able to interpret market information and calculate hedging problems associated with marketing industry. This knowledge will be evidenced by completion of assignment sheets and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with marketing crops to the correct definitions.
2. Select from a list factors that add dollars to the marketing cost of products.
3. Distinguish between *supply* and *demand*.
4. Select from a list factors that distinguish between supply and demand curves.
5. Select from a list factors that affect the share which farmers receive on commodities.
6. Select from a list factors causing shifts in demand of a commodity.
7. Select from a list factors that influence time to market.
8. Select from a list sources for marketing crops.
9. Select from a list advantages of home storage versus commercial storage.
10. Select from a list disadvantages of home storage of crops.
11. Match the classes of elevators to the correct descriptions.
12. Select from a list the main functions of product standards.
13. Select from a list factors that determine the federal grades of grain.

14. Discuss in a short paragraph what is meant by nonrecourse loans under the Commodity Credit Corporation.

15. Match the steps of the marketing channel to the correct definitions.

16. Discuss in a short paragraph hedging as it relates to crop marketing.

17. Select from a list ways a farmer might use grain futures.

18. Select from a list sources of crop market information.

19. Plot demand and supply curves.

20. Calculate problems of marketing crops by hedging.

21. Interpret market information.

MARKETING CROPS
UNIT IV

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

   A. Provide student with objective sheet.

   B. Provide student with information and assignment sheets.

   C. Discuss unit and specific objectives.

   D. Discuss information sheet.

   E. Work assignment sheets before class.

   F. Develop a crossword puzzle to introduce terms and definitions.

   G. Have student work assignment sheets in class.

   H. Develop a hedging problem using a crop in the area.

   I. Give test.

II. Instructional materials:

   A. Objective sheet

   B. Information sheet

   C. Assignment sheets

      1. Assignment Sheet #1--Plot Demand and Supply Curves

      2. Assignment Sheet #2--Calculate Problems of Marketing Crops by Hedging

      3. Assignment Sheet #3--Interpret Market Information

   D. Answers to assignment sheets

   E. Test

   F. Answers to test

III. Unit references:

   A. Walton, E. V. O., and Holt, O. M. *Profitable Southern Crops.* Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1959.

   B. Hughes, Harold D., and Metcalf, Darrel S. *Crop Production.* New York: The Macmillan Co., n.d.

C. Hamilton, James E., and Bryant, W. R. *Profitable Farm Management.* Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1963.

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MARKETING CROPS
UNIT IV

INFORMATION SHEET

I. Terms and definitions

A. Market--Place at which an exchange of commodities occurs between a buyer and a seller

B. Marketing--Activity involved in buying or selling a product

C. Cooperative marketing--Process whereby farmers pool their crops for shipment to market to increase bargaining power

D. Commodity Credit Corporation--Independent agency of the USDA responsible for making loans to farmers

E. Parity price--Price a farmer must receive for a crop to enable the farmer to buy the same amount of goods and services now as could be bought from the same quantity for a previous year based on the average price of the most recent ten years

$$\frac{\text{average price of commodity, most recent 10 years}}{\text{average index of all prices received, most recent 10 years}} \times \text{current index of prices paid} = \text{current parity price}$$

F. Basis--Difference between the cash and futures markets

G. Re-seal--Extension of storage of grain for recourse of an extended commodity credit loan

H. Marketing margin--Difference between the amount consumers pay for the final product and the amount producers receive

I. Law of demand--Principle in economics which states that the quantity of an economic good purchased will vary inversely with its price

(NOTE: The lower the price is, the more goods will be purchased; conversely, the higher the price is, the less goods will be purchased.)

J. Effective demand--Desire of the consumer for the commodity backed up by purchasing powers

K. Equilibrium price--Price toward which actual prices will tend to move

(NOTE: The equilibrium price is the point where supply and demand are equal.)

INFORMATION SHEET

- L. Contract--Promise to deliver or accept delivery of a specific grade of commodity at a specified time, place, and price
- M. Speculator--Individual who makes a living buying and selling on the futures market
- N. Market information--Process of collecting, interpreting, and disseminating large varieties of data which are necessary to the smooth operation of the marketing process
- O. Futures trading--Making a contract in which a seller agrees to deliver a commodity at a stated place at a future date and the buyer agrees to accept and pay for such commodity at the time of delivery
- P. Marketing channel--Movement of a commodity from producer to final consumer

II. Factors that increase marketing costs

- A. Transportation costs
- B. Increased demand by consumers for service and quality
- C. Quantity of food moving through market channels
- D. General rise in price levels

III. Supply and demand

- A. Demand--Schedule of different quantities of a commodity that buyers will purchase at different prices at a given time and place
- B. Supply--Schedule of different quantities of a commodity that will be offered for sale at different prices at a given time and place

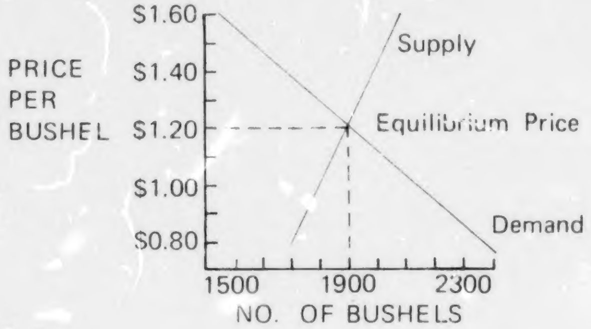
IV. Supply and demand curves (Assignment Sheet #1)

- A. Demand curve always slopes downward

INFORMATION SHEET

B. Supply curve always slopes upward

(NOTE: The point of intersection where supply and demand cross is known as the *equilibrium price*.)



V. Factors affecting farmers' share on commodities

- A. Processing

  Example: Cost of changing product form to satisfy the consumer

- B. Perishability

  Example: Spoilage is great; expensive refrigeration

- C. Bulkiness

  Example: Products requiring large quantities of space

- D. Extreme seasonality of production

  Example: Quick market products

VI. Factors causing shifts in demand

- A. Population increase or decrease
- B. Difference in income and purchasing power
- C. Changes in tastes and preferences of consumers
- D. Cost of product
- E. Expectations of buyers

INFORMATION SHEET

VII. Factors influencing time to market

- A. Price at harvesttime
- B. Futures
- C. Carry-over
- D. Cost of storage
- E. Storage facilities
- F. Financial status of producer
- G. Potential export
- H. Projected national yield

VIII. Sources for marketing crops

- A. Home farm use

  (NOTE: Grains may be used for animal consumption on the farm or in a commercial feedlot. The grains also may be processed by local feed manufacturing plants.)

- B. Local and/or terminal elevators
- C. Direct to export

IX. Advantages of home storage vs commercial storage

- A. Retains control of crop
- B. Receives storage payment on re-seal program
- C. Is cheaper than commercial storage
- D. Receives full value of government loan
- E. Provides an opportunity for direct sale to export

X. Disadvantages of home storage

- A. Cost of facilities
- B. Increased handling cost
- C. Shrinkage loss
- D. Risk of heat and insect damage
- E. Additional cost of insurance

INFORMATION SHEET

XI. Classes of elevators

A. Country

1. Independent--Elevator operated and controlled by individuals within the community

2. Cooperative--Elevator operated cooperatively by farmers of the area

3. Line--Elevator owned and operated by a central headquarters or chain

B. Terminal--Elevator operated by grain dealers or merchants who buy grain for storage and later sell to millers and processors or export

(NOTE: Because of the large storage capacity and investment powers, the terminal elevator operators/owners are able to utilize the futures market for hedging. The practice of buying and selling in futures is used by all elevator operators as they purchase grain.)

XII. Functions of product standards

A. Eliminate abuse in market

B. Provide foundation for market system

C. Protect farmer, buyer, and consumer

XIII. Factors determining federal grades of grain

A. Test weight

B. Moisture content

C. Purity of type

D. Soundness of kernels

E. Cleanliness

F. Condition of grain

XIV. Nonrecourse loan--Program sponsored by the Commodity Credit Corporation whereby a farmer "seals" a commodity in acceptable storage for a guaranteed price

(NOTE: A farmer may obtain a loan on the produced crop based on the amount of the support price. If the market rises above the loan, the farmer sells and repays the loan. If the market price never reaches the loan rate, the farmer delivers the commodity to the government and thereby fulfills the obligation.)

INFORMATION SHEET

XV. Steps of marketing channel

A. Assembling--Bringing together of crops for shipment

B. Grading--Sorting the crop group for uniform quality and size

C. Processing--Putting crop into usable form for consumer

D. Transporting--Moving the crop to market

E. Storing--Storing of crop for future use or until a higher price can be obtained

F. Financing--Loaning as a form of credit to a farmer until the crop can be sold or processed

G. Risk-taking--Assuming risk until the crop has been sold or processed

XVI. Hedging--Purchasing or selling commodity futures to offset the risk of loss from changing market prices (Assignment Sheet #2)

(NOTE: The successful operation of hedging rests upon the assumption that futures and cash commodity prices move up and down together. The mechanics of hedging involves making simultaneous but opposite transactions on the futures and cash markets. That is, if cash wheat is purchased, future wheat is immediately sold and vice versa.)

Example:	Cash market	Futures market
On day of purchase	Purchased 50,000 bushels of wheat at $2.00 per bushel	Sold 50,000 bushels of wheat at $2.10 per bushel
On day of cash sale	Sold 50,000 bushels of wheat at $1.95 per bushel	Purchased 50,000 bushels of wheat at $2.05 per bushel
	Lost 5 cents per bushel on cash market	Gained 5 cents per bushel on the futures market

(NOTE: When cash grain was purchased, futures were sold. When cash grain was sold, futures were purchased. The cash market declined, and the farmer lost five cents a bushel when finally selling the grain. However, the futures market also fell, and there was a net gain of five cents a bushel on futures transactions. This was a perfect hedge because the loss on one market was exactly offset by the gain on the other.)

INFORMATION SHEET

XVII. Ways of using grain futures

   A. Price crop any time prior to harvest

   B. Set price of product without taking immediate delivery

   C. Fix price of grain in storage for deferred delivery

   D. Speculate

XVIII. Sources of crop market information (Assignment Sheet #3)

   A. Radio and television stations

   B. Newspapers

   C. U.S. Department of Agriculture

      1. *Federal Market News*

      2. *Agricultural Marketing Service*

   D. Magazines

   E. Local elevators or markets

   F. Feed stores

   G. U. S. Department of Commerce

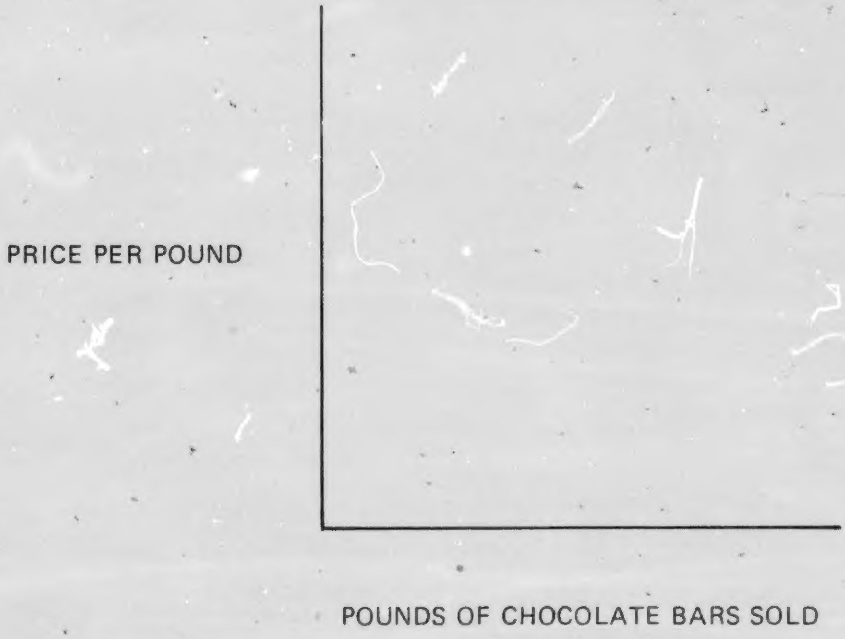
MARKETING CROPS
UNIT IV

ASSIGNMENT SHEET #1--PLOT DEMAND AND SUPPLY CURVES

Use the following demand and supply schedules for chocolate bars in an assumed trade area to answer the questions below.

Price Per Pound	Pounds of Chocolate Bars per Year			
	Demand	Supply	Surplus	Shortage
$ 0.50	100,000	300,000	200,000	0
0.40	150,000	250,000	100,000	0
0.30	200,000	200,000	0	0
0.20	250,000	150,000	0	100,000
0.10	300,000	100,000	0	200,000

1. If the price were 50¢ per lb, what would happen?
2. If the price were 10¢ per lb, what would happen?
3. What is the equilibrium price in the above example?
4. Plot a demand curve and a supply curve for the above table and estimate the equilibrium price. Show work on graph below.



MARKETING CROPS
UNIT IV

ASSIGNMENT SHEET #2--CALCULATE PROBLEMS OF MARKETING CROPS BY HEDGING

Suppose you were a farmer and had 20,000 bushels of wheat to market. The price of wheat on the cash market today was $1.35 per bushel, and the futures market was $1.40 per bushel on a specified month. How would you be able to hedge to assure yourself of the $1.35 per bushel at a later date? Calculate the problem and show your work. When completed, turn in to instructor for evaluation.

MARKETING CROPS
UNIT IV

ASSIGNMENT SHEET #3--INTERPRET MARKET INFORMATION

By using the different sources of market information, find out the cash market price of the crops listed below. Also, if possible, find out what the futures market will be on each crop and the month of the futures. Be sure to record your source of market information and identify the board on which the market futures were based. When completed, return to instructor for evaluation.

Source of market information ____________________ Date ____________________

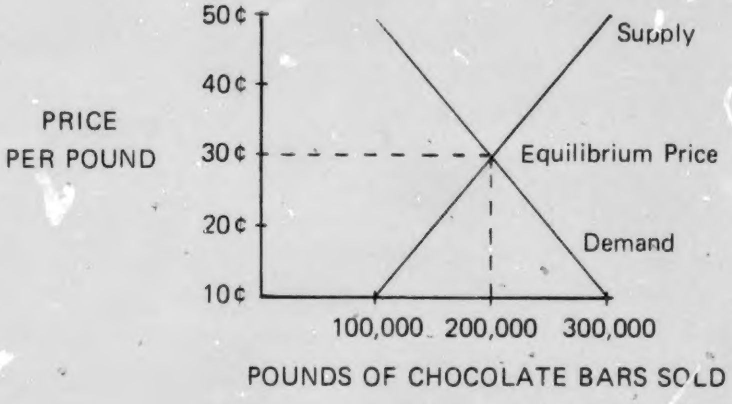
Cash Price	Futures Price	Board Location	Month of Futures
Wheat ____________	Wheat ____________	____________	____________
Corn ____________	Corn ____________	____________	____________
Cotton ____________	Cotton ____________	____________	____________
Grain sorghums ______	Grain sorghums ______	____________	____________
Oats ____________	Oats ____________	____________	____________

MARKETING CROPS
UNIT IV

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1

1. There would be a surplus of chocolate bars
2. There would be a shortage of chocolate bars
3. 30¢ per pound
4.



Assignment Sheet #2

	Cash Market	Futures Market
On day of cash purchase	Purchased 20,000 bushels wheat @ $1.35 per bushel	Sold 20,000 bushels wheat @ $1.45 per bushel
On day of cash sale	Sold 20,000 bushels wheat @ $1.30 per bushel	Purchased 20,000 bushels wheat @ $1.40 per bushel
	Lost 5 cents a bushel on cash transactions	Gained 5 cents a bushel on the futures transactions

Assignment Sheet #3--To be evaluated to the satisfaction of the instructor

MARKETING CROPS
UNIT IV

TEST

NAME ______________________________ SCORE ____________

1. Match the terms on the right to the correct definitions. (Answers to "a" through "j" are on this page.)

______a. Movement of a commodity from producer to final consumer

______b. Activity involved in buying or selling a product

______c. Making a contract in which a seller agrees to deliver a commodity at a stated place at a future date and the buyer agrees to accept and pay for such commodity at time of delivery

______d. Process whereby farmers pool their crops for shipment to market to increase bargaining power

______e. Process of collecting, interpreting, and disseminating large varieties of data which are necessary to the smooth operation of the marketing process

______f. Independent agency of the USDA responsible for making loans to farmers

______g. Individual who makes a living buying and selling on the futures market

______h. Price a farmer must receive for a crop to enable the farmer to buy the same amount of goods and services now as could be bought from the same quantity for a previous year based on the average price of the most recent ten years

______i. Promise to deliver or accept delivery of a specific grade of commodity at a specified time, place, and price

______j. Difference between the cash and futures markets

1. Basis
2. Commodity Credit Corporation
3. Parity price
4. Cooperative marketing
5. Contract
6. Speculator
7. Market information
8. Futures trading
9. Marketing channel
10. Marketing

_____k. Place at which an exchange of commodities occurs between a buyer and a seller

_____l. Extension of storage of grain for recourse of an extended commodity credit loan

_____m. Price toward which actual prices will tend to move

_____n. Difference between the amount consumers pay for the final product and the amount producers receive

_____o. Desire of the consumer for the commodity backed up by purchasing powers

_____p. Principle in economics which states that the quantity of an economic good purchased will vary inversely with its price

11. Market
12. Effective demand
13. Equilibrium price
14. Law of demand
15. Re-seal
16. Marketing margin

2. Select from the following list factors that add dollars to the marketing cost of products.

_____a. General rise in price levels

_____b. Transportation costs

_____c. Storage cost

_____d. Increased demand by consumers for service and quality

_____e. Quantity of food moving through market channels

3. Distinguish between supply (S) and demand (D) by placing the correct letters in the blanks provided.

_____a. Schedule of different quantities of a commodity that will be offered for sale at different prices at a given time and place

_____b. Schedule of different quantities of a commodity that buyers will purchase at different prices at a given time and place

4. Select from the following list factors that distinguish between supply and demand curves.

_____a. Demand curve always slopes upward

_____b. Supply curve always slopes upward

_____c. Demand curve always slopes downward

5. Select from the following list factors that affect the share which farmers receive on commodities.

______a. Processing

______b. Bulkiness

______c. Extreme seasonality of production

______d. Perishability

6. Select from the following list factors causing shifts in demand of a commodity.

______a. Expectations of sellers

______b. Cost of product

______c. Population increase or decrease

______d. Expectations of buyers

______e. Changes in tastes and preferences of consumers

______f. Difference in income and purchasing power

7. Select from the following list factors that influence time to market.

______a. Price at harvesttime

______b. Futures

______c. Price at planting time

______d. Cost of storage

______e. Cost of fertilizer

______f. Carry-over

______g. Storage facilities

______h. Shipping cost

8. Select from the following list sources for marketin[illegible]ops.

______a. Direct to export

______b. Home farm use

______c. Local and/or terminal elevators

9. Select from the following list advantages of home storage versus commercial storage.

_____ a. Decreases handling cost

_____ b. Increases heat damage to stored crop

_____ c. Retains control of crop

_____ d. Receives full value of government loan

_____ e. Lowers cost of storage facilities

_____ f. Is cheaper than commercial storage

_____ g. Provides an opportunity for direct sale to export

_____ h. Receives storage payment on re-seal program

10. Select from the following list disadvantages of home storage.

_____ a. Increased handling cost

_____ b. Decreased handling cost

_____ c. Risk of heat and insect damage

_____ d. Cost of facilities

_____ e. Decrease in shrinkage

_____ f. Shrinkage loss

11. Match the classes of elevators on the right to the correct descriptions.

_____ a. Elevator operated by grain dealers or merchants who buy grains for storage and later sell to millers and processors or export

_____ b. Elevator operated and owned from a central headquarters or chain

_____ c. Elevator operated cooperatively by farmers of the area

_____ d. Elevator operated and controlled by individuals within the community

1. Terminal
2. Independent
3. Cooperative
4. Line

12. Select from the following list the main functions of product standards.

_____a. Provide foundation for market system

_____b. Protect grain from contamination

_____c. Protect farmer, buyer, and consumer

_____d. Eliminate abuse in market

_____e. Create order in market system

13. Select from the following list factors that determine federal grades of grain.

_____a. Test weight

_____b. Type of grain

_____c. Moisture content

_____d. Number of insects

_____e. Purity of type

_____f. Condition of grain

_____g. Cleanliness

14. Discuss nonrecourse loans under the Commodity Credit Corporation.

____

____

____

____

15. Match the seven steps of the marketing channel on the right to the correct definitions.

_____a. Putting crop into usable form for consumer

_____b. Storing of crop for future use or until a higher price can be obtained

_____c. Moving the crop to market

_____d. Bringing together of crops for shipment

_____e. Sorting the crop group for uniform quality and size

1. Storing
2. Grading
3. Assembling
4. Processing
5. Transporting
6. Financing
7. Risk-taking

_____f. Assuming risk until the crop has been sold or processed

_____g. Loaning as a form of credit to a farmer until the crop can be sold or processed

16. Discuss hedging as it relates to crop marketing.

____

____

____

____

17. Select from the following list ways a farmer might use grain futures.

_____a. Decide how many areas to plant

_____b. Speculate

_____c. Increase sales

_____d. Price crop any time prior to harvest

_____e. Fix price of grain in storage for deferred delivery

_____f. Set price of product without taking immediate delivery

18. Select from the following list sources of crop market information.

_____a. Feed stores

_____b. *Newsweek*

_____c. Local elevators or markets

_____d. Magazines

_____e. County extension departments

_____f.. Newspapers

_____g. Radio and television stations

19. Plot demand and supply curves.

20. Calculate problems of marketing crops by hedging.

21. Interpret market information.

(NOTE: If activities 19-21 have not been accomplished prior to the test, ask the instructor when they should be completed.)

MARKETING CROPS
UNIT IV

ANSWERS TO TEST

1. a. 9
   b. 10
   c. 8
   d. 4
   e. 7
   f. 2
   g. 6
   h. 3
   i. 5
   j. 1
   k. 11
   l. 15
   m. 13
   n. 16
   o. 12
   p. 14
2. a, b, d, e
3. a. S
   b. D
4. b, c
5. a, b, c, d
6. b, c, d, e, f
7. a, b, d, f, g

8. a, b, c

9. c, d, f, g, h

10. a, c, d, f

11. a. 1

    b. 4

    c. 3

    d. 2

12. a, c, d

13. a, c, e, f, g

14. Program sponsored by the Commodity Credit Corporation whereby a farmer "seals" a commodity in acceptable storage for a guaranteed price

15. a. 4

    b. 1

    c 5

    d. 3

    e. 2

    f. 7

    g. 6

16. Purchasing or selling commodity futures to offset the risk of loss from changing market prices

17. b, d, e, f

18. a, c, d, f, g

19. Evaluated to satisfaction of instructor

20. Evaluated to satisfaction of instructor

21. Evaluated to satisfaction of instructor

LAWN CARE MANAGEMENT
UNIT V

UNIT OBJECTIVE

After completion of this unit, the student should be able to select careers associated with lawn care and management. The student should be able to select the best methods of weed control, fertilization, and mowing practices to follow in lawn care. This knowledge will be evidenced by completion of the assignment sheet and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with lawn care to the correct definitions.
2. Select from a list careers associated with lawn care.
3. Match types of grasses to growing characteristics.
4. Match types of grasses to the proper time to fertilize a lawn.
5. Identify methods of applying lawn fertilizers.
6. Match types of grasses to the correct mowing heights.
7. Select from a list conditions that determine amount and frequency of watering a lawn.
8. Match lawn problems to the correct control methods.
9. Survey a lawn to determine type of grass, fertilizer needs, weed control, and mowing height.

LAWN CARE MANAGEMENT
UNIT V

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

   A. Provide student with objective sheet.

   B. Provide student with information and assignment sheets.

   C. Make transparencies.

   D. Discuss unit and specific objectives.

   E. Discuss information and assignment sheets.

   F. Secure lot to use for lawn management survey.

   G. Contact representative of local lawn care service as a resource person.

   H. Give test.

II. Instructional materials:

   A. Objective sheet

   B. Information sheet

   C. Transparency master: TM 1--Types of Fertilizer Spreaders

   D. Assignment Sheet #1--Survey a Lawn

   E. Test

   F. Answers to test

III. Unit references:

   A. Musser, H. Burton. *Turf Management.* New York: McGraw-Hill, 1962.

   B. Crockett, James U., and editors of Time-Life Books. *Lawn and Ground Covers.* New York: Time-Life Books, 1973.

   C. Mitchell, Paul J. "Landscape Maintenance Schedule." *OSU Extension Facts,* no. 6408. Stillwater: Oklahoma State University, n.d.

   D. Tripp, Leland D. "Turfgrass Varieties for Oklahoma." *OSU Extension Facts,* no. 2650. Stillwater: Oklahoma State University, n.d.

E. Tripp, Leland D., and Huffine, Wayne W. "Turf Management on Home Lawn." *OSU Extension Facts,* no. 2653. Stillwater: Oklahoma State University, n.d.

F. Garrett, J. C. *Better Lawns for Oklahoma*, no. E703. Stillwater: Oklahoma State University, n.d.

G. Tripp, Leland D., and Huffine, Wayne W. "Weed Control in Turf." *OSU Extension Facts,* no. 2652. Stillwater: Oklahoma State University, n.d.

LAWN CARE MANAGEMENT
UNIT V

INFORMATION SHEET

I. Terms and definitions

   A. Weed--Plant growing where it is not desired; plant out of place

   B. Herbicide--Chemical used to control vegetation

   C. Turf--Soil bound by grass and plant roots into a thick mat

   D. Thatch--Accumulation of dead grass and clippings in turf at soil surface

   E. Aeration--Providing air to soil

   (NOTE: Aerifiers overcome the effects of soil compaction by removing small plugs of soil from the lawn. This process loosens and aerates the soil.)

   F. Synthetic--Artificial

   G. Tolerant--Able to withstand an adverse condition

   H. Dormant--Nongrowing condition

II. Careers associated with lawn care

   A. Agronomist/Horticulturist

   (NOTE: The agronomist/horticulturist may teach and do research in turf grass and conduct experiments to improve the quality of turf grass through breeding, environmental control, and cultural techniques.)

   B. Golf course superintendent

   (NOTE: The golf course superintendent supervises and coordinates the activities of workers on the course and is responsible for improving and maintaining the turf without interrupting play on the course.)

   C. Athletic field superintendent

   (NOTE: The athletic field superintendent is responsible for the maintenance of playing and practice fields, which includes lining and marking the playing areas, setting goal posts, and maintaining turf grass.)

   D. Landscape contractor

   (NOTE: The landscape contractor establishes and maintains turf and shrubbery on properties according to a landscape plan, estimates costs, and bids for landscaping jobs.)

INFORMATION SHEET

E. Turf supplies sales representative

(NOTE: The sales representative calls upon individuals or businesses to show his/her products, provide performance and use information, and take orders for the products.)

F. Greensworker

(NOTE: The greensworker operates mowers, Aerifiers, vertical mowers, and other power equipment. She/he applies lime, fertilizers, and pesticides at rates prescribed by the superintendent.)

III. Types of grasses and their characteristics

(NOTE: It is recommended that only the adapted varieties for the climatic conditions be planted.)

A. Bermuda

1. Is most widely used lawn grass in Oklahoma
2. Grows vigorously
3. Spreads by above-ground runners and underground root stalks
4. Is very aggressive in its invasion habits
5. Does not thrive in conditions of heavy shade, poor drainage, high acidity, or low fertility

B. Buffalo

1. Is common to western Oklahoma
2. Is best native lawn grass for sunny locations and heavy clay soils
3. Is very drought tolerant
4. Requires less frequent mowing than bermuda grass
5. Does not invade plant beds as aggressively as bermuda grass

C. Centipede

1. Is shade tolerant
2. Requires only moderate amounts of nitrogen
3. Is tolerant of low organic content soils

INFORMATION SHEET

D. Zoysia

1. Requires two years or more to establish

2. Adapts to moderate shade or full sun

(NOTE: The zoysias are extremely vigorous grasses. Because they grow so thick, they keep out crabgrass in areas where crabgrass is a severe problem.)

E. Fescue

1. Is used for permanently shaded lawn conditions

2. Remains green most of the year except for some browning during extended hot or extremely cold periods

(NOTE: Thick seeding, adequate fertilizing and watering, and frequent mowing to a height of 2" are essential for growing the best turf. Clumpy growth results if the seeding rate is not heavy.)

IV. Proper time to fertilize

A. Fescues and other cool season grasses--Early spring and early fall

(NOTE: Cool season grasses are those that make their maximum growth in the spring and fall and are dormant or semidormant in hot weather.)

B. Bermuda, zoysia, and centipede--During summer when most active

(NOTE: Warm season grasses are those that make their maximum growth in hot weather. DO NOT apply fertilizer when grass leaves are wet. Water lawn immediately after applying fertilizer to wash the fertilizer off the leaves to prevent the grass plant from burning.)

V. Methods of applying lawn fertilizers (Transparency 1)

A. Broadcast type spreader

(NOTE: This type of spreader distributes fertilizer from a drum in a circular pattern. It is less accurate but applies fertilizer much faster than the seeder spreader. It makes a pattern about eight feet wide.)

B. Seeder type spreader

(NOTE: The seeder type spreader applies fertilizer by using an augering device to aid gravity. Fertilizer is applied closer to the ground in a two foot wide pattern. This type of spreader is more accurate but much slower than the broadcast fertilizer spreader.)

INFORMATION SHEET

VI. Correct mowing heights for most lawn grasses

A. Bermuda--1/2" to 3/4"

B. Zoysia--1/2" to 3/4"

C. Fescue--2" to 3"

D. Centipede--1 1/4" to 2"

E. Buffalo--1/2" to 3/4"

(NOTE: The best procedure is to mow often enough so that not more than 1/2" of leaf tip is removed at any one time. Mowing date is determined by leaf growth, not by the number of days since the last mowing.)

VII. Conditions that determine amount and frequency of watering lawn

A. Type of soil

(NOTE: Soil type determines the quantity of water that may be stored in the soil and the speed with which it is absorbed.)

B. Kind of grass

(NOTE: Water requirements and tolerances to drought conditions are determined by the kind of grass.)

C. Climate

VIII. Lawn problems and control methods

A. Crabgrass--DCPA (dacthal) or siduron in mid-March to April, just before seed germination

B. Broadleaf weeds--2,4-D in spring and fall

Example: Dandelions

C. Insects--Chlordane, diazinon, and carbaryl

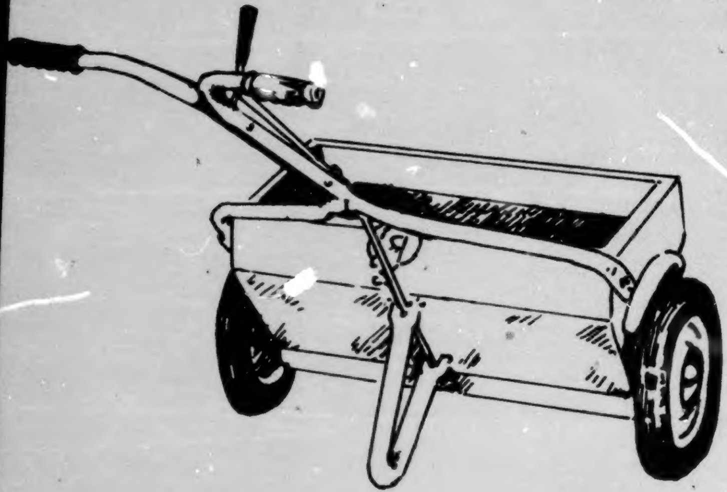
Examples: Ants, May beetle grubs, armyworms, chinch bugs

D. Disease--Good establishment and maintenance

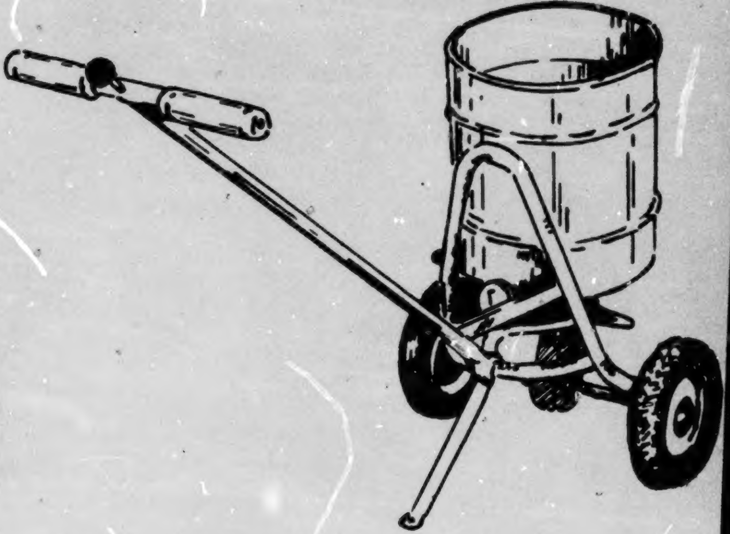
Examples: Brown patch, dollar spot, leaf spot

(NOTE: Most damage due to disease can be reduced by mowing no shorter than 1 3/4" to 2" and by using adequate fertilizer but avoiding overstimulation with nitrogen.)

Types of Fertilizer Spreaders



Seeder Type Spreader



Broadcast Type Spreader

LAWN CARE MANAGEMENT
UNIT V

ASSIGNMENT SHEET #1--SURVEY A LAWN

Survey a lawn and provide the information requested below. Using the guide, recommend the amount of herbicide needed for each problem. Make recommendations concerning the amount of fertilizer to use according to the soil test requirements.

TURF INFORMATION SHEET

For establishment ___

For maintenance ___

Type of area (check one)

___ Lawn
___ Park
___ Cemetery
___ Athletic field
___ School lawn

___ Green
___ Tee
___ Fairway
___ Rough
___ Roadside

Grass species present (check)

___ Bermuda
___ Fescue
___ Zoysia
___ Buffalo
___ Centipede

Height at which mower is set to cut

___ Less than 1 1/2"
___ 1 1/2" or higher

Check special problems

___ Crabgrass
___ Other weeds
___ Mowing
___ Irrigation
___ Thatch
___ Disease
___ Insects
___ Shade
___ Soil compaction
___ Moss and algae
___ Fertilization

___ Liming
___ Erosion

ASSIGNMENT SHEET #1

1. What is the size of the lot survey?

2. What type of fertilizer would you recommend? Why?

3. What amount of fertilizer will be needed?

4. What type of herbicide would you recommend? Why?

5. When would you recommend that the application of herbicide occur?

6. What would you recommend for an average mowing height?

When completed, return to instructor for evaluation.

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Science Serving Agriculture
No. 2652

Weed Control in Turf

Leland D. Tripp and Wayne W. Huffine
Extension Crops Specialist and Professor of Agronomy

Weeds steal space, water, light and nutrients from the turf. They increase maintenance costs, harbor insects and plant diseases, decrease turf quality and reduce real estate values.

Chemical weed killers (herbicides) are one of the main weapons in the fight against weeds; however, careless or wrong use of these chemicals can make them useless or even dangerous. Their correct use requires only common-sense care and *following the manufacturer's directions.* READ THE LABEL!

Avoid prolonged exposure of skin or eyes to herbicide solutions or sprays. Wash down spraying equipment before handling or adjusting without protection of gloves.

SOME SUGGESTED HERBICIDES FOR THE CONTROL OF WEEDS IN BERMUDAGRASS, ZOYSIA, OR BUFFALOGRASS LAWNS ARE GIVEN IN TABLE I.

The label gives the amount of active ingredient in the herbicide. This is given in pounds per gallon for liquids and as a percentage for wettable powders and granular materials.

Weeds are usually easier to kill when they are young, small, and in an active stage of growth.

Time of spraying and rate and method of application are important to effective weed control. Spraying at the wrong time can give poor weed control and/or serious turf injury.

TABLE 1. — SELECTED WEED CONTROL PROGRAM

Weed	*Herbicide*	*Rate/Acre, a.i.* Per Application*	*Suggested Time*	*Comments*
Annual bluegrass *(Poa annua)*	Betasan (G) Betasan (L) Dacthal (WP) Balan	15 20 15 5	Mid-August	August treatment combined with spring application for crabgrass will speed *Poa annua* control.
Annual bromes	Dacthal (WP)	15	Mid-August	Thoroughly water to get the material down to the soil surface.
Chickweed	Banvel Silvex (L)	.5 to 1 .5 to 1	Dec.-Jan. Feb.-Mar.	Low rate can be used in Dec., and Jan.; high rate in Feb. and March. Protect susceptible plants against drift. Avoid application of Banvel on or near desirable trees (especially those that are shallow rooted) or other plants, or on areas where their roots may extend or in locations where the chemical may be washed or moved into contact with their roots.
Clover Black Medic Bur Hop White	2,4,5-T (L)	1	Mar. or early April	Apply when clover is actively growing. Protect susceptible plants against drift.
Crabgrass (before emergence)	Betasan (G,L) Dacthal (WP) Presan (L)	15 12.5 15	March	Thoroughly water to get the material down to the soil surface.
Crabgrass (after emergence)	DSMA (L,WP) AMA (L)	2.4 2.5	April to Nov.	Easiest to control when the plants are young and growing actively. Repeat application 10-14 days apart may be needed for good control.

Weed	Herbicide	Rate/Acre, a.i.* Per Application	Suggested Time	Comments
Dallisgrass	AMA MSMA DSMA (L,WP) & 2,4-D (L)	2.5 2 3 (DSMA) and 1 (2,4-D)	May-June	Repeat 2 to 3 times at 7 to 10 day intervals. Protect susceptible plants.
Dandelion	2,4-D (L)	1	Nov.-Dec.	Best time to treat is in the fall, next best is in March. Protect susceptible plants against drift.
Dwarf fleabane	2,4-D (L)	1	May-June	Best control when plants are in active growth. Protect susceptible plants.
Foxtail Yellow and green	Dacthal (WP)	12.5	March	Thoroughly water to get material down to the soil surface.
	DSMA (L,WP) AMA (L) MSMA (L, WP)	2.4 2.5 2	April to Nov.	Repeat application 10-14 days apart may be needed for good control.
Goosegrass (before emergence)	Betasan (G,L) Dacthal (WP) Presan (L)	15 12.5 15	March	Thoroughly water to get the material down to the soil surface.
Goosegrass (after emergence)	DSMA (L,WP) AMA (L) MSMA (L,WP)	2.4 2.5 2	April to Nov.	Easiest to control when the plants are young and growing actively. Repeat application 10-14 days apart may be needed for good control.
Henbit	Banvel Silvex (L)	.5 to 1 .5 to 1	Dec.-Jan. Feb.-Mar.	Low rate can be used in Dec., and Jan.; high rate in Feb. and Mar. Protect susceptible plants against drift. Avoid application of Banvel on or near desirable trees (especially those that are shallow rooted) or other plants, or on areas, where their roots may extend or in locations where the chemical may be washed or moved into contact with their roots.
Knotweed	Banvel (L)	1	Apr., May June	Treat when the plants are actively growing. Avoid application of Banvel on or near desirable trees (especially those that are shallow rooted) or other plants, or on areas where their roots may extend or in locations where the chemical may be washed or moved into contact with their roots.
Little barley	Dacthal (WP)	12.5	Sept.	Thoroughly water to get the material down to the soil surface.
Milk purslane	2,4-D (L)	1	May-June	Best control when plants are in active growth. Protect susceptible palnts.
Nutgrass	DSMA (L,WP) AMA (L) MSMA (L,WP)	2.4 2.5 2	May-Sept.	Before treatment the lawn should not be mowed for about one week to permit the nutgrass plants to grow. Repeat every 4 to 5 weeks. Continue the treatment each year until the nutgrass is eradicated.
Plantain	2,4-D (L)	1	Mar.-Apr.	Best control when plants are in active growth. Protect susceptible plants against drift.
Poison ivy	2,4,5-T (L) Silvex (L)	1 1	Mar.-June	Best control when plants are in active growth. Protect susceptible plants.
Puncture vine	2,4-D (L)	1	Mar.-June	Best control when plants are in active growth. Protect susceptible plants against drift.
Sandbur (after emergence)	AMA (L) CMA (L) DSMA MSMA	2.5 1.5 2.4 2	May-Sept.	Follow manufacturer's instructions as given for crabgrass control. Repeat application 10-14 days apart may be needed for good control.
Spring beauty	2,4-D (L)	1	Mar. or early April	Best control when plants are in active growth. Protect susceptible plants.
Wild garlic	2,4-D (ester) (L) Maleic Hydrazide (L)	1 3	Mar., April Oct., Nov.	Treat in both spring and fall. May require treatment annually for 2 to 4 years. Protect susceptible plants.

***a.i.—Active Ingredient. (L) Liquid; (G) Granular; (WP) Wettable Powder.**

Weed	Herbicide	Rate/Acre, a.i.* Per Application	Suggested Time	Comments
Wild onion	2,4-D (ester) (L) Maleic Hydrazide (L)	1 3	Mar., Apr. Oct., Nov.	Treat in both spring and fall. May require treatment annually for 2 to 4 years. Protect susceptible plants.
Woodsorrel	Silvex (L)	1	Mar., or early April	Best control when plants are in active growth. Protect susceptible plants against drift.

TABLE II. — CONVERSION TABLE FOR LIQUID FORMULATIONS.

Rate Desired Lbs./A	Concentration of Active Ingredient in Formulation, lbs./gal.													
	1		2		2.5		3		4		5		6	
	Amount To Apply Per 1,000 Square Feet													
	ml.	oz.	ml.	oz.	ml.	oz.	ml.	oz.	ml.	oz.	ml.	oz.	ml.	oz.
1	86.7	2.9	43.3	1.5	34.7	1.2	28.9	1.0	21.7*	0.7	17.3	0.6	14.4	0.5
2	173.0	5.8	86.7	2.9	69.3	2.3	57.8	1.9	43.3	1.5	34.7	1.2	28.9	1.0
3	260.0	8.8	130.0	4.4	104.0	3.5	86.7	2.9	65.0	2.2	52.0	1.7	43.3	1.5
4	348.0	11.7	174.0	5.9	139.0	4.7	116.0	3.9	86.9	2.9	69.5	2.3	57.9	1.9
5	434.0	14.7	217.0	7.3	174.0	5.9	145.0	4.9	109.0	3.7	86.8	2.9	72.4	2.4
6	521.0	17.6	260.0	8.8	208.0	7.0	147.0	5.9	130.0	4.4	101.0	3.5	86.8	2.9
7	608.0	20.5	304.0	10.3	243.0	9.8	203.0	6.8	152.0	5.1	122.0	4.1	101.0	3.4
8	694.0	23.4	347.0	11.7	278.0	9.4	231.0	7.8	174.0	5,9	139.0	4.7	116.0	3.9
9	781.0	26.4	390.0	13.2	312.0	10.5	260.0	8.8	195.0	6.6	156.0	5.3	130.0	4.4
10	867.0	29.3	433.0	14.6	347.0	11.7	289.0	9.8	217.0	7.3	173.0	5.8	144.0	4.9

*Example: To treat 1,000 square feet at the rate of 1 lb./A of active ingredient using a formulation containing 4 lbs. active ingredient per gallon, use 21.7 ml., or 0.7 oz. of the formulation containing 4 lbs. active ingredient per gallon and distribute evenly over 1000 sq. ft.

Conversion Factors

1 fluid ounce = 29.6 ml.	1 quart = 946 ml.
1 dry ounce = 28.4 grams	1 pound = 453.6 grams

TABLE III. — CONVERSION TABLE FOR DRY FORMULATIONS.

Rate Desired Lbs./A	Concentration of Active Ingredient in Formulation												
	100%	90%	80%	75%	70%	60%	50%	40%	30%	25%	20%	10%	5%
	Grams of Herbicide per 1,000 sq. ft.												
1	10.4	11.6	13.0	13.9	14.9	17.4	20.8	26.0	35	42	52	104	208
2	20.8	23.1	26.0	27.8	29.8	34.7	41.7	52	69	83	104	208	417
3	31.2	34.7	39.0	41.7	44.6	52.0	62.5	78	104	125	156	312	625
4	41.7	46.3	52.1	55.5	59.5	69.4	83.3*	104	139	167	208	417	833
5	52.1	57.9	65.1	69.4	74.4	86.8	104.0	130	174	208	260	521	1040
6	62.5	69.4	78.1	83.3	89.3	104.0	125.0	156	208	250	312	625	1250
7	72.9	81.0	91.1	97.2	104.0	121.0	146.0	182	243	292	364	729	1460
8	83.3	92.6	104.0	111.0	119.0	139.0	167.0	208	278	333	417	833	1670
9	93.7	104.0	117.0	125.0	134.0	156.0	187.0	234	312	375	469	937	1870
10	104.0	116.0	130.0	139.0	149.0	174.0	208.0	260	347	417	521	1040	2080

*Example: To treat 1,000 sq. ft. at the rate of 4 lbs./A active ingredient using a formulation containing 50% active ingredient, use 83.3 grams of the 50% formulation and distribute evenly over the 1,000 sq. ft.

Know your weed species and the limitations of the herbicides used as shown on the label.

Terms Used and What They Mean

The time a herbicide is applied to a lawn area generally will determine its effectiveness in weed control. Herbicides used on lawns and other turfed areas are commonly classified according to their time of application in respect to the weed. That is to say, a PRE-EMERGENCE HERBICIDE is one which is applied prior to emergence of the specific weed of interest. A POST-EMERGENCE HERBICIDE on the other hand is one which is applied after emergence of the specific weed of interest. One exception to this classification perhaps would be methyl bromide which may be used at any stage of weed development for short term but complete soil sterilization essentially.

Some herbicides are very hard to remove from sprayers. If practical, it is best to avoid using the sprayer for other chemicals if it has been used to spray 2,4-D, 2,4,5-T, 2,4,5-TP (silvex), or other phenoxy compounds.

To remove 2,4-D or similar material, flush out the sprayer with a water-detergent solution immediately after use. Then fill the tank and prime the system with an ammonia solution (three tablespoonsful of household ammonia per gallon of water). Leave this solution in the system for 24 hours, then flush with water.

Most other herbicides can be removed with water-detergent solution alone. Check manufacturer's directions on cleaning equipment.

THE BEST WEED CONTROL
IS A GOOD DENSE TURF

The information given herein is for educational purposes. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by the Cooperative Extension Service is implied.

Useful Tables and Helpful Hints

Linear Measure
1 foot = 12 inches
1 yard = 3 feet = 36 inches
1 rod = 5 1/2 = 16 1/2 feet
1 mile = 320 rods = 1760 yards = 5280 feet

Square Measure
1 square foot = 144 square inches
1 square yard = 9 square feet
1 square rod = 30 1/4 square yards = 272 1/4 square feet
1 acre = 160 sq. rds. = 4840 sq. yds. = 43,560 sq. ft.

Table of Equivalents
Measurements in cups and spoons mean level measuring cup and level measuring spoon. Abbreviations: Teaspoonful = Tsp. Tablespoonful = Tbs.

Teaspoons
3 teaspoonful = 1 tablespoonful = 15 ml. = 1/2 ounce

Tablespoons
2 tablespoonsful = 1/8 cup or 1 fluid ounce
4 tablespoonsful = 1/4 cup or 2 fluid ounces
8 tablespoonsful = 1/2 cup or 4 fluid ounces or 1/4 pint
16 tablespoonsful = 1 cup or 8 fluid ounces or 1/2 pint

Cupsful, Pints, Quarts
2 cupsful = 1 pint or 16 fluid ounces or 32 tablespoonsful
2 pints = 1 quart or 946.35 ml.
4 quarts = 1 gallon or 3785.4 ml.

Dry Weight
1 ounce = approximately 2 tablespoonsful dry weight

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, J. C. Evans, Vice President for Extension, Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma.
Rev. 1269/18M 05

LAWN CARE MANAGEMENT
UNIT V

TEST

NAME ______________________________ SCORE ______________

1. Match terms associated with lawn care on the right to the correct definitions.

_____a. Able to withstand an adverse condition

_____b. Nongrowing condition

_____c. Providing air to soil

_____d. Soil bound by grass and plant roots into a thick mat

_____e. Chemical used to control vegetation

_____f. Plant growing where it is not desired; plant out of place

_____g. Accumulation of dead grass and clippings in turf at soil surface

_____h. Artificial

1. Herbicide
2. Turf
3. Weed
4. Thatch
5. Dormant
6. Tolerant
7. Synthetic
8. Aeration

2. Select from the following list careers associated with lawn care.

_____a. Athletic field superintendent

_____b. Feed sales representative

_____c. Agronomist/Horticulturist

_____d. Greensworker

_____e. Landscape contractor

_____f. Golf course superintendent

3. Match the types of grasses on the right to their growing habits and characteristics.

_____a. Requires two years or more to establish; adapts to moderate shade or full sun

_____b. Is used for permanently shaded lawn conditions; remains green most of the year except for some browning during extended hot or extremely cold periods

_____c. Is common to western Oklahoma; is best native lawn grass for sunny locations and heavy clay soils; is very drought tolerant; requires less frequent mowing than bermuda grass; does not invade plant beds as aggressively as bermuda grass

_____d. Is most widely used lawn grass in Oklahoma; grows vigorously; spreads by above-ground runners and underground root stalks; is very aggressive in its invasion habits; does not thrive in conditions of heavy shade, poor drainage, high acidity, or low fertility

_____e. Is shade tolerant; requires only moderate amounts of nitrogen; is tolerant of low organic content soils

1. Fescue
2. Centipede
3. Zoysia
4. Buffalo
5. Bermuda

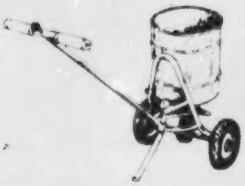
4. Match the grasses on the right to the proper time to fertilize. (Blanks may have more than one answer.)

_____a. Early spring and early fall

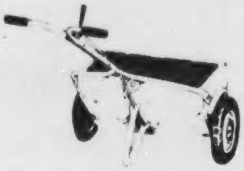
_____b. During summer when most active

1. Zoysia
2. Fescue
3. Centipede
4. Bermuda

5. Identify from the drawings below two methods of applying lawn fertilizers.



a. ______________________________



b. ______________________________

6. Match the types of grass on the right to the correct mowing heights. (Blanks may have more than one answer.)

_____a. 1/2" to 3/4"

_____b. 1 1/4" to 2"

_____c. 2" to 3"

1. Bermuda
2. Fescue
3. Zoysia
4. Centipede
5. Buffalo

7. Select from the list below conditions that determine amount and frequency of watering a lawn.

_____a. Amount of winter rainfall

_____b. Kind of grass

_____c. Amount of weeds

_____d. Type of soil

_____e. Climate

8. Match the lawn problems on the right to the correct control methods.

_____a. DCPA (dacthal) or siduron in mid-March to April, just before seed germination

_____b. Chlordane, diazinon, and carbaryl

_____c. 2,4-D in spring and fall

_____d. Good establishment and maintenance

1. Broadleaf weeds
2. Crabgrass
3. Disease
4. Insects

9. Survey a lawn to determine type of grass, fertilizer needs, weed control, and mowing height.

(NOTE: If this activity has not been accomplished prior to the test, ask the instructor when it should be completed.)

LAWN CARE MANAGEMENT
UNIT V

ANSWERS TO TEST

1. a. 6
   b. 5
   c. 8
   d. 2
   e. 1
   f. 3
   g. 4
   h. 7

2. a, c, d, e, f

3. a. 3
   b. 1
   c. 4
   d. 5
   e. 2

4. a. 2
   b. 1, 3, 4

5. a. Broadcast type spreader
   b. Seeder type spreader

6. a. 1, 3, 5
   b. 4
   c. 2

7. b, d, e

8. a. 2
   b. 4
   c. 1
   d. 3

9. Evaluated to the satisfaction of the instructor

FUNDAMENTALS OF GARDENING
UNIT VI

UNIT OBJECTIVE

After completion of this unit, the student should be able to list factors in selecting a garden site. The student should be able to select methods of weed, insect, and disease control and identify tools and materials needed for gardening. The student should be able to germinate vegetable seed. This knowledge will be evidenced by completion of the job sheet and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with gardening to the correct definitions.
2. Select from a list factors to consider in selecting a garden site.
3. Select from a list factors to consider in determining the size of a garden.
4. Name reasons for planning and laying out a garden on paper.
5. Select from a list characteristics of good seed.
6. Name sources of good seed of the desired varieties.
7. Select from a list reasons for transplanting vegetables.
8. Select from a list vegetables which are normally transplanted.
9. Distinguish between advantages of commercial versus home-grown transplants.
10. Select from a list common structures used to grow plants.
11. Match vegetables to common planting dates.
12. Match types of pests to the correct methods of control.
13. Select from a list benefits of mulches.
14. Name materials that can be used as mulches.
15. Identify tools needed in gardening.
16. Select from a list the steps needed in preparing the soil for planting.

17. Name methods of irrigation to use in the garden.
18. Select from a list items which can be used as containers in a minigarden.
19. Name vegetables which may be grown in a minigarden.
20. Demonstrate the ability to germinate vegetable seed.

FUNDAMENTALS OF GARDENING
UNIT VI

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

  A. Provide student with objective sheet.

  B. Provide student with information and job sheets.

  C. Make transparencies.

  D. Discuss unit and specific objectives.

  E. Discuss information sheet.

  F. Obtain seeds for germination test.

  G. Make slide to show different mulches and how they may be used.

  H. Secure horticulture slide set from CIMC to identify vegetables and fruits.

  I. Have student collect and identify ten vegetable seeds.

  J. Contact local seed dealer to serve as resource person and to provide seeds for germination test.

  K. Demonstrate and discuss procedure outlined on the job sheet.

  L. Give test.

II. Instructional materials:

  A. Objective sheet

  B. Information sheet

  C. Transparency masters

    1. TM 1--Gardening Tools

    2. TM 2--Gardening Tools (Continued)

    3. TM 3--Gardening Tools (Continued)

    4. TM 4--Minigarden Containers

  D. Assignment Sheet #1--Plan a Garden on Paper

  E. Job Sheet #1--Germinate Vegetable Seed

  F. Test

  G. Answers to test

III. Unit references:

A. Campbell, Raymond E. "Oklahoma Garden Planning Guide." *OSU Extension Facts,* no. 6004. Stillwater: Oklahoma State University, n.d.

B. U. S. Department of Agriculture. *Minigardens for Vegetables*, no. 163. Washington, D.C.: U. S. Government Printing Office, n.d.

C. U. S. Department of Agriculture. *Growing Vegetables in the Home Garden*, no. 202. Washington, D.C.: U. S. Government Printing Office, n.d.

D. Campbell, Raymond E., and Kays, W. R. "Vegetable Varieties for Oklahoma." *OSU Extension Facts,* no. 6011. Stillwater: Oklahoma State University, n.d.

E. Greer, Howard, and Campbell, Raymond E. "Weed Control in the Home Garden." *OSU Extension Facts,* no. 6015. Stillwater: Oklahoma State University, n.d.

F. Romshe, Franklin A. "Mulching Vegetable Garden Soils." *OSU Extension Facts,* no. 6005. Stillwater: Oklahoma State University, n.d.

G. Campbell, Raymond E. "Improving Garden Soil Fertility." *OSU Extension Facts,* no. 6007. Stillwater: Oklahoma State University, n.d.

H. Reed, L. B., and Webb, Raymond E. *Insects and Diseases of Vegetables in the Home Garden,* no. 46. Washington, D.C.: U. S. Government Printing Office, n.d.

IV. Slides--"Horticulture ID and Judging Slides."

(NOTE: This slide set with script from State FFA contest includes vegetable and plant identification and judging classes of apples, pecans, carnations, and pfitzer juniper. The set is available from the Curriculum and Instructional Materials Center, State Department of Vocational and Technical Education, 1515 W. Sixth Avenue, Stillwater, Oklahoma 74074)

FUNDAMENTALS OF GARDENING
UNIT VI

INFORMATION SHEET

I. Terms and definitions

A. Garden--Ground for growing fruits, flowers, and vegetables

B. Leaf crop--Crop produced for leafy vegetative parts

Examples: Lettuce, turnip greens, cabbage

C. Fruit crop--Crop grown to produce a pulpy, edible part from flower

Examples: Corn, beans, tomatoes

D. Root crop--Crop grown for its edible root parts

Examples: Turnips, sweet potatoes, carrots

E. Variety--Specific type of plant species

Examples: Detroit Dark Red and Early Wonder are two varieties of beets

F. Transplanting--Moving a plant from one place to another

G. Compost--Mixture of decayed leaves and plant material for fertilizing soil in which plants grow

H. Sterilization--Killing all living material in the soil

I. Bush type--Plant which supports itself

J. Pole type--Plant with runners which require support

K. Weed--Plant growing out of place

L. Mulch--Material placed around a plant to control weeds and conserve soil moisture

M. Cold frame--Small plant-growing structure which is not heated

N. Hardening--Conditioning a transplant to withstand adverse weather conditions by restricting water and lowering temperature over a period of time

O. Viable--Capable of sprouting

P. Minigarden--Vegetables raised in small area such as a pot or trash can

INFORMATION SHEET

II. Factors to consider in selecting a garden site

   A. Convenience to home and water

   B. Soil quality

   C. Sufficient sunlight

   D. Space available

   E. Soil drainage

   F. Plant root competition from trees, grass, other plants

   G. Protection from animals

III. Size of garden

   A. Needs

   B. Anticipated production

   C. Time available

   (NOTE: Family requirements have a direct relationship to garden size.)

IV. Reasons for planning and laying out a garden on paper (Assignment Sheet #1)

   A. Give a sense of direction

   B. Avoid costly mistakes

      Examples: Overplanting or underplanting, overuse or underuse of supplies, poor location or spacing of plants

V. Characteristics of good seed

   A. True to variety name

   B. Viable

   C. Free of other kinds of seed

   D. Free of disease and insect injury

INFORMATION SHEET

VI. Sources of good seed

- A. Seed dealer
- B. Seed catalog
- C. Seed rack in stores

VII. Reasons for transplanting vegetables

- A. Hasten harvesting time of crop
- B. Conserve seed
- C. Provides only means of propagation
- D. Improve economics of crop production

VIII. Vegetables which are normally transplanted

- A. Cabbage
- B. Tomatoes
- C. Peppers
- D. Onions
- E. Cauliflower
- F. Eggplant
- G. Broccoli

(NOTE: Sometimes head lettuce, cantaloupes, watermelons, and cucumbers are transplanted.)

IX. Commercial vs home-grown transplants

- A. Commercial
    1. Usually more disease free
    2. Lower priced
    3. Less trouble

INFORMATION SHEET

B. Home-grown

1. Available when needed
2. True to variety name
3. More varieties available

X. Common structures for growing plants

A. Greenhouse

B. Well-lighted window

C. Grow light

D. Cold frame

E. Hotbed

(NOTE: The difference between a hotbed and cold frame is the presence of artificial heating devices such as heat lamps or soil heating cables in the hotbed.)

XI. Vegetables and common planting dates

	Planting Dates		
Vegetables	February 10 to March 15	March 15 to April 15	April 10 to April 30
Sweet corn		X	
Tomatoes (set plants)			X
Beans			X
Cucumbers			X
Beets		X	
Irish potatoes	X		

XII. Methods of weed, insect, and disease control

A. Weeds

1. Cultivation
2. Hoeing
3. Use of mulches
4. Chemical control measures

INFORMATION SHEET

- B. Insects
  - 1. Resistant varieties
  - 2. Biological control
  - 3. Chemical control
- C. Diseases
  - 1. Resistant varieties
  - 2. Disease-free seed
  - 3. Chemical treatment of seeds, plants, and/or soils

XIII. Benefits of mulches

- A. Increases water-holding capacity of soil
- B. Supplies nitrogen
- C. Increases soil fertility
- D. Prevents erosion
- E. Keeps soil cool

XIV. Materials for mulching

- A. Dry grass clippings
- B. Vegetable tops
- C. Leaves
- D. Cottonseed hulls
- E. Straw

XV. Tools needed in gardening (Transparencies 1 through 3)

- A. Round-pointed shovel
- B. Hoe
- C. Garden rake
- D. Lawn rake

INFORMATION SHEET

E. Spading fork (potato fork)

F. Rotary tiller

G. Wheel hoe and attachments

H. Sprayers and dusters

1. Hand duster
2. Hose proportioner
3. Compressed air sprayer
4. Can with holes

XVI. Soil preparation

A. Provide good drainage, aeration, and high fertility

B. Test soil

C. Alter soil by adding organic matter, sand, or gypsum

(NOTE: On tight clay soil, add 1 to 2 inches sand, 2 to 3 inches organic matter, and 6 to 8 pounds gypsum per 100 square feet of garden. Spade 8 to 10 inches deep in winter or early spring.)

XVII. Methods of irrigation

A. Flood

B. Sprinkler system

C. Trickle

XVIII. Containers for minigardens (Transparency 4)

A. Plastic trash can

B. Half-bushel basket

C. Clay pot

D. Plastic bag

E. Metal pail

INFORMATION SHEET

XIX. Vegetables grown in minigardens

A. Tomatoes

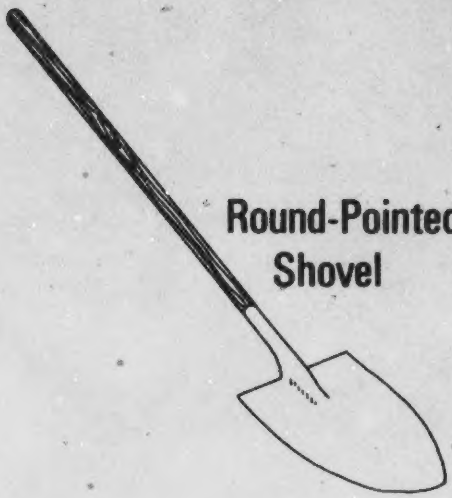
B. Lettuce

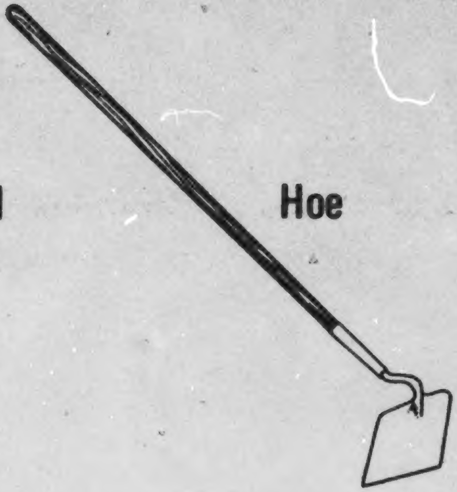
C. Radishes

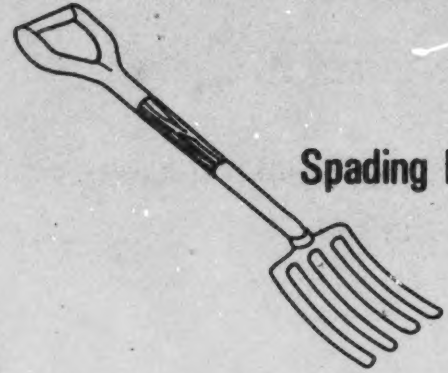
D. Peppers

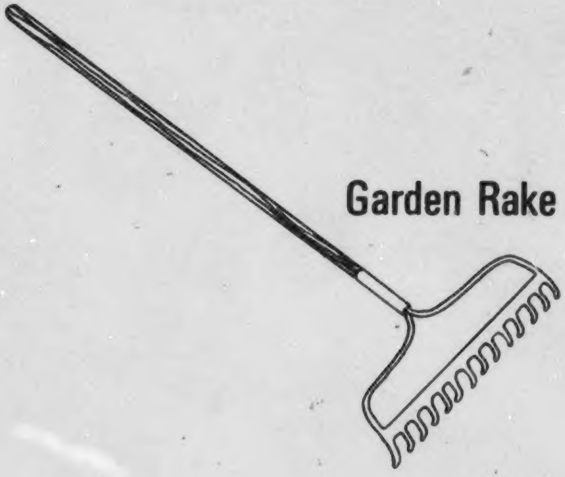
E. Onions

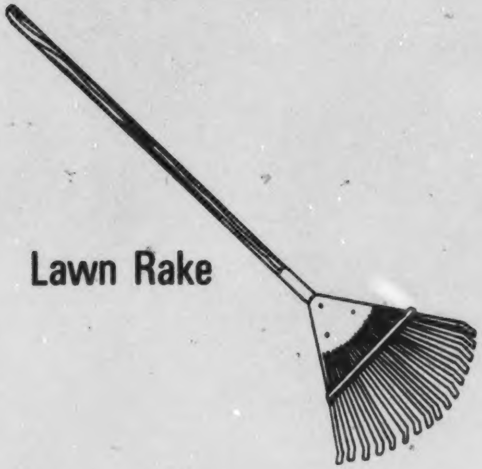
Gardening Tools


Round-Pointed Shovel


Hoe

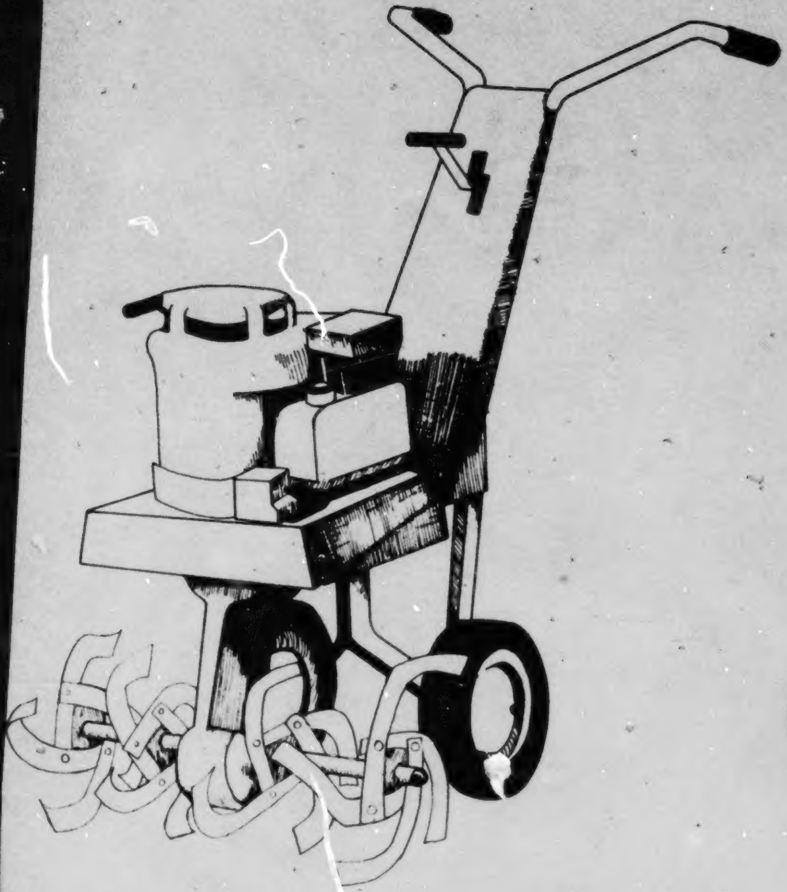

Spading Fork


Garden Rake

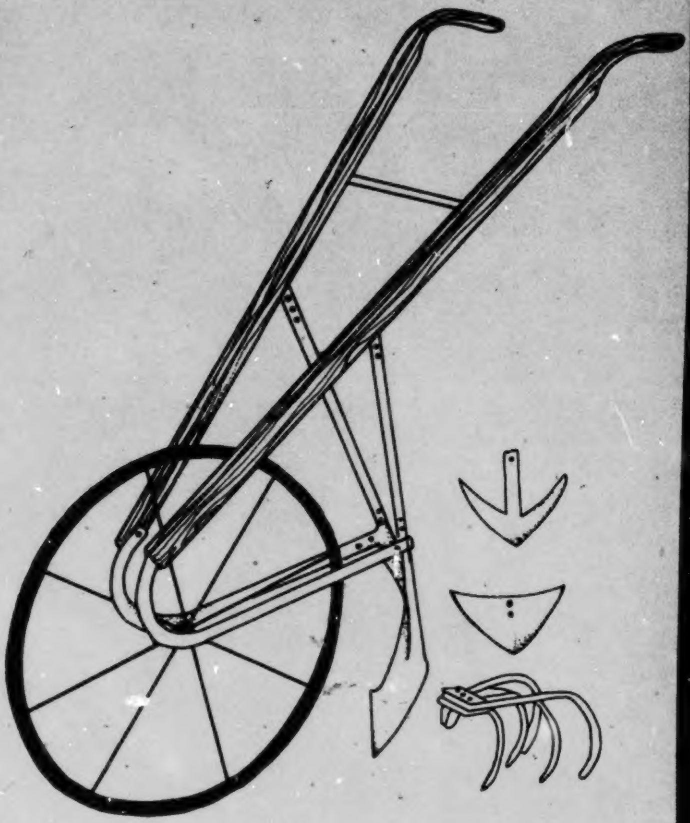

Lawn Rake

Gardening Tools

(Continued)



Rotary Tiller

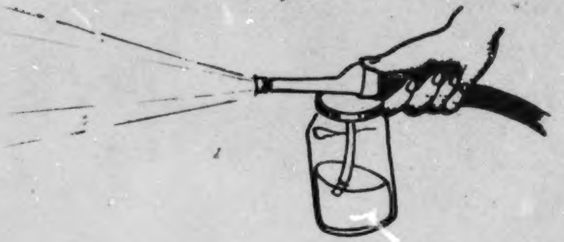


Wheel Hoe and Attachments

Gardening Tools

(Continued)

Compressed Air Sprayer



Hose Proportioner

Can with Holes

Hand Duster

Sprayers and Dusters

Minigarden Containers

Half-Bushel Basket

Plastic Trash Can

Metal Pail

Plastic Bag

Clay Pot

FUNDAMENTALS OF GARDENING
UNIT VI

ASSIGNMENT SHEET #1--PLAN A GARDEN ON PAPER

Using *OSU Fact Sheet* no. 6004, develop a list of ten preferred vegetables and arrange them in a best-liked priority. Determine the feet of row required for each vegetable selected to meet your needs. Use the following chart to arrange selected vegetables in the garden.

GARDEN PLANNING CHART

Vegetable Variety	Feet of Row Required	Planting Date	Seasonal Maturity	Comments
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

Oklahoma Garden Planning Guide

OSU
Extension
Facts

Published by Oklahoma State University
Distributed Through County Extension Offices

No. 6004

Raymond E. Campbell
Extension Vegetable Crop Specialist

A well planned, properly managed home garden can furnish Oklahoma families with flavorful and high quality fresh vegetables from spring through fall, as well as providing an ample supply for processing or storing as a winter vegetable supply.

The small amount invested in seeds, fertilizer, spray materials, and a few tools is more than offset by the enjoyment, healthful outdoor exercise and fresh "homegrown" flavor of vegetables the garden will provide.

Choosing the Site

The selection and preparation of the garden site is an important key in growing a home garden successfully. An area exposed to full or near full sunlight with deep, well drained fertile soil is ideal. While many urban gardeners have little choice as to site selection, by modifying certain cultural practices and types of crops grown, many sites can be utilized successfully. It is very important that the garden be located near a water supply and away from trees and shrubs that would compete for light, water, and nutrients.

Planning the Garden

The accompanying chart can be of help in determining the family requirements of the different vegetables suggested. To find the number of feet of row for the family, multiply Column 2 by the number in the family and enter this number in Column 3. To find the amount of seed or number of plants needed, check Columns 3 and 8 to figure the amount of seed or number of plants required and enter the figure in Column 9.

The perennial vegetables (asparagus, rhubarb, winter onions, etc.) should be planted at one side or end of the garden for efficient operation. The hardy vegetables planted early in the season should be planted together so they can be followed with late season planting of the same or other vegetables and those vegetables requiring similar cultural practices should be grouped together for ease of care.

The vegetables on the chart are grouped into cool season and warm season crops, indicating under which conditions they grow best. These crops classed as cool season can be planted earlier in the season and thrive best under cool conditions while those grouped as warm season crops grow better during warm temperatures.

Based on the temperature that the plants will withstand, some vegetables are hardy, semi-hardy, tender, or very tender (Column 10). The hardy ones may be planted before the date of the last killing frost. The semi-hardy ones will be injured by a hard frost but will grow in cool weather and not be harmed by a light frost. The tender plants are injured or may be even killed by a light frost but can withstand cool weather, while the very tender are injured by cool weather.

Gardening Tips

In order to have a successful garden, the gardener must follow a few rules. The following tips may help to prevent some common garden problems from occurring, or help overcome those that do arise.

Sample soil and have it tested every 3 to 4 years.

Apply fertilizers to garden area in recommended manner and amount.

Make use of organic materials such as animal manure and compost where available.

Use recommended varieties.

Thin when plants are small.

Use mulches to conserve moisture, control weeds, and reduce rots.

Avoid excessive walking and working in the garden when the foliage and soil are wet.

Examine garden often to keep ahead of potential problems.

Keep garden free of weeds, insects, and diseases.

Wash and clean well all tools and sprayers after use.

When possible harvest vegetables during the cool hours of the day.

Avoid the following mistakes:

Planning so closely that you cannot walk or work in the garden.

Placing fertilizer directly in contact with plant roots or seeds.

Cultivating deeply so as to injure plant roots.

Depending on varieties not recommended for your area. Do try new releases.

Watering frequently or excessively so that the soil is always wet and soggy.

Allowing weeds to grow large before beginning to cultivate.

Applying chemicals or pesticides in a haphazard manner or without reading label directions.

Using chemicals not specifically recommended for garden crops.

Storing left over diluted spray.

For additional information, consult these Fact Sheets available at your local County Extension Office:

Mulching Vegetable Garden Soils No. 6005

Commercial Fertilizer Use in Home Garden No. 6006

Improving Garden Soil Fertility No. 6007

Fall Gardening No. 6009

Vegetable Varieties for Oklahoma No. 6011

For insect and disease recommendations, contact your local County Extension Office.

Garden Planning Guide

VEGETABLE	Time To Plant	Feet of Row Per Person	Feet of Row Per Family	Method of Planting	Spacing		Depth to Cover Seed	Seed Needed Per 100 ft.	Seed Or Plants Needed	Resistance Frost
Column	(1)	(2)	(3)	(4)	Between Rows (5)	Within Rows (6)	(7)	(8)	(9)	(10)
COOL SEASON										
Asparagus	Fall or Spring	20		Crowns	4 ft.	2 ft.	6 in.	50		Hardy
Beet	March	20		Seed	1½ ft.	4 in.	1 in.	2 oz.		Semi-Hardy
Broccoli	March	9		Seed or plants	3 ft.	18 in.	½ in.	½ oz. or 65 plants		Hardy
Cabbage	Feb. 15 to March 10	20		Seed or plants	3 ft.	18 in.	½ in.	½ oz. or 65 plants		Hardy
Carrot	Feb 15 to March 10	20		Seed	1½ ft.	3 in.	½ in.	½ oz.		Semi-Hardy
Cauliflower	Feb. 15 to March 10	15		Seed or plants	3 ft.	18 in.	½ in.	½ oz. or 65 plants		Semi-Hardy
Chard, Swiss	Feb. 15 to March 10	10		Seed	1½ ft.	3 in.	½ in.	½ oz.		Semi-Tender
Chinese Cabbage	Feb. 15 to March 10	10		Seed	3 ft.	18 in.	½ in.	½ oz.		Hardy
Lettuce, Bibb	Feb 15 to March 10	20		Seed or plant	1½ ft.	3 in.	¼ in.	¼ oz. or 100 plants		Semi-Hardy
Lettuce, Leaf	Feb 15 to March 10	20		Seed	1½ ft.	3 in.	¼ in.	¾ oz.		Semi-Hardy
Onion	Feb. 15 to March 10	25		Sets	1½ ft.	4 in.	1 in.	1 qt. sets		Hardy
Onion	Feb. 15 to March 10	25		Seed or plants	1½ ft.	4 in.	3 in.	½ oz. or 300 plants		Hardy
Pea	Feb. 15 to March 10	30		Seed	3 ft.	2 in.	2 in.	1 lb.		Hardy
Potato, irish	Feb. 15 to March 10	150		Tuber pieces	3 ft.	12 in.	4 in.	7 lbs.		Semi-Hardy
Radish	March 1 to April 15	15		Seed	1 ft.	2 in.	½ in.	1 oz.		Hardy
Rhubarb	Fall or Spring	20		Crowns	4 ft.	2 ft.	3 in.	50 crowns		Hardy
Spinach	Feb. 15 to March 10	35		Seed	1½ ft.	2 in.	½ in.	¾ oz.		Hardy

VEGETABLE	Time To Plant	Feet of Row Per Person	Feet of Row Per Family	Method of Planting	Spacing		Depth to Cover Seed	Seed Needed Per 100 ft.	Seed Or Needed Plants	Frost Resistance
					Between Rows	Within Rows				
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Turnip	Feb. 15 to March 10	30		Seed	1½ ft.	3 in.	½ in.	¼ oz.		Hardy
WARM SEASON Bean, Lima	April 15-30	20		Seed	3 ft.	3 in.	1 in.	1 lb.		Tender
Beans, Green or Wax	April 10-30	40		Seed	3 ft.	3 in.	1 in.	½ lb.		Tender
Beans, Pole	April 10-30	40		Seed	4 ft.	4 in.	1 in.	½ lb.		Tender
Cantaloupe	May 1-20	20		Seed	5 ft.	48 in.	1 in.	½ oz.		Very-Tender
Cucumber	April 10-30 or later	20		Seed	4 ft.	36 in.	½ in.	½ oz.		Very-Tender
Eggplant	April10-30	10		Plants	3 ft.	12 in.		100 plants		Very-Tender
Okra	April 10-30 or later	20		Seed	3 ft.	12 in.	1 in.	1 oz.		Tender
Pepper	April10-30 or later	10		Plants	3 ft.	12 in.		100 plants		Tender
Pumpkin	April 10-30 or later	30		Seed	5 ft.	60 in.	1 in.	½ oz.		
Southern Pea	May 1-June10	20		Seed	3 ft.	4 in.	1 in.	½ lb.		Tender
Squash, Summer	April 10-30 or later	30		Seed	4 ft.	36 in.	1 in.	½ oz.		Very-Tender
Squash, Winter	April 10-30 or later	30		Seed	5 ft.	48 in.	1 in.	½ oz.		Very-Tender
Sweet Corn	Mar. 15-April 15	60		Seed	3 ft.	12 in.	1 in.	¼ lb.		Tender
Sweet Potato	May 1-June 10	70		Plants	3 ft.	12 in.		100 plants		Very-Tender
Tomato	April 10-30	36		Plants	4 ft.	36 in.		33 plants		Tender
Watermelon	May 1-20	20		Seed	5 ft.	60 in.	1 in.	1 oz.		Very-Tender

178-A

Common Garden Problems

Symptoms	Possible Causes	Corrective Measures
Plants stunted in growth; sickly, yellow color	Lack of soil fertility or soil pH abnormal	Use fertilizer and correct pH according to soil test. Use 2 to 3 pounds of complete fertilizer per 100 square feet in absence of soil test.
	Plants growing in compacted, poorly-drained soil	Modify soil with organic matter or coarse sand.
	Insect or disease damage	Use a regular spray or dust program.
	Iron deficiency	Apply iron to soil or foliage.
Plants stunted in growth; sickly, purplish color	Low temperature	Plant at proper time. Don't use light-colored mulch too early in the season.
	Low available phosphate	Apply sufficient phosphate at planting.
Holes in leaves; leaves yellowish and drooping, or distorted in shape	Damage by insects	Use recommended insecticides at regular intervals.
Plant leaves with spots; dead, dried areas; or powdery or rusty areas	Plant disease	Use resistant varieties, remove diseased plants when they are noticed and use a regular spray program.
Plants wilt even through sufficient water is present	Soluble salts too high or root system damage	Have soil tested by county Extension agent. Use soil insecticides, fungicides and resistant varieties.
	Poor drainage and aeration	Use organic matter or sand in soil.
	Insect or nematode damages	Use recommended varieties and soil insecticides or nematicides.
Plants tall, spindly, and unproductive	Excessive shade	Relocate to sunny area. Keep down weeds.
	Excessive nitrogen	Reduce applications of nitrogen.
Blossom drop (tomatoes)	Hot dry periods	Use mulch and water. Plant heat tolerant varieties.
	Low night temperatures	Avoid planting too early in the spring.
	Overwatering or disease	Stop watering or use regular spray program.
Tomato leaf roll	Excessive pruning or soil moisture fluctuations	Remove suckers when small. Use mulches.
Leathery, dry, brown blemish on the blossom end of tomatoes, peppers and watermelons	Blossom end rot	Maintain a uniform soil moisture supply. Avoid overwatering and excessive nitrogen.

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02-76/36M Reprint 10

FUNDAMENTALS OF GARDENING
UNIT VI

JOB SHEET #1--GERMINATE VEGETABLE SEED

I. Material needed

   A. Absorbent paper

      Example: Paper towel

   B. Vegetable seed

   C. Plastic wrapping material

      Example: Saran Wrap

   D. Rubber bands

II. Procedure

   A. Place two sheets of wet absorbent paper on sheet of plastic wrapping

   B. Place twenty-five seeds on absorbent paper with five rows of five seeds each

   C. Place a third wet sheet of absorbent paper on top of seed and roll carefully

   D. Fold each end and seal with rubber bands on each end

      (NOTE: Roll should contain three sheets with plastic sheet on outside to hold moisture.)

   E. Place on shelf at room temperature

   F. Watch for germination

      (NOTE: Seeds should germinate by sixth day.)

   G. Record results

      1. Variety of vegetables ____________________

      2. Number of seeds that germinated ____________________

      3. Percent of germination ____________________

FUNDAMENTALS OF GARDENING
UNIT VI

TEST

NAME ______________________ SCORE __________

1. Match the terms on the right to the correct definitions.

_____a. Crop produced for leafy vegetative parts

_____b. Plant growing out of place

_____c. Moving a plant from one place to another

_____d. Vegetables raised in small area such as a pot or trash can

_____e. Capable of sprouting

_____f. Crop grown to produce a pulpy, edible part from flower

_____g. Mixture of decayed leaves and plant material for fertilizing soil in which plants grow

_____h. Killing all living material in the soil

_____i. Plant which supports itself

_____j. Ground for growing fruits, flowers, and vegetables

_____k. Crop grown for its edible root parts

_____l. Plant with runners which require support

_____m. Specific type of plant species

_____n. Material placed around a plant to control weeds and conserve soil moisture

_____o. Small plant-growing structure which is not heated

_____p. Conditioning a transplant to withstand adverse weather conditions by restricting water and lowering temperature over a period of time

1. Bush type
2. Variety
3. Transplanting
4. Compost
5. Garden
6. Leaf crop
7. Pole type
8. Weed
9. Fruit crop
10. Mulch
11. Root crop
12. Cold frame
13. Hardening
14. Sterilization
15. Viable
16. Minigarden

2. Select from the following list factors to consider in selecting a garden site.

   _____a. Soil drainage

   _____b. Soil quality

   _____c. Convenience to home and water

   _____d. Sufficient sunlight

   _____e. Plant root competition from trees, grass, other plants

   _____f. Protection from animals

3. Select from the following list factors to consider in determining size of a garden.

   _____a. Type of equipment

   _____b. Time available

   _____c. Market outlets

   _____d. Needs

   _____e. Anticipated production

4. Name two reasons for planning and laying out a garden on paper.

   a. ____

   b. ____

5. Select from the following list characteristics of good seed.

   _____a. Viable

   _____b. Germination rate

   _____c. Ability to grow

   _____d. True to variety name

   _____e. Free of other kinds of seed

   _____f. Free of disease and insect injury

6. Name two sources of good seed of the desired varieties.

   a. ____

   b. ____

7. Select from the following list reasons for transplanting vegetables.

_____a. Conserve space

_____b. Conserve seed

_____c. Hasten harvesting time of crop

_____d. Improve economics of crop production

_____e. Provides only means of propagation

8. Select from the following list vegetables which are normally transplanted.

_____a. Bush beans

_____b. Tomatoes

_____c. Carrots

_____d. Onions

_____e. Cabbage

_____f. Potatoes

_____g. Peppers

_____h. Cauliflower

_____i. Eggplant

9. Distinguish between the advantages of commercial (C) vs home-grown (H) transplants by placing the correct letters in the blanks provided.

_____a. Available when needed; true to variety name; more varieties available

_____b. Usually more disease free; lower priced; less trouble

10. Select from the following list common structures used to grow plants.

_____a. Grow light

_____b. Basement

_____c. Well-lighted window

_____d. Hotbed

_____e. Kitchen

_____f. Cold frame

_____g. Greenhouse

11. Match the vegetables on the right to the common planting dates. (Blanks may have more than one answer.)

_____a. February 10 to March 15

_____b. April 10 to April 30

_____c. March 15 to April 15

1. Irish potatoes
2. Beets
3. Beans
4. Sweet corn

12. Match the pests on the right to the correct methods of control.

_____a. Resistant varieties; biological control; chemical control

_____b. Cultivation; hoeing; use of mulches; chemical control measures

_____c. Resistant varieties; disease-free seed; chemical treatment of seeds, plants, and/or soils

1. Weeds
2. Insects
3. Diseases

13. Select from the list below the benefits of mulches.

_____a. Keeps soil cool

_____b. Increases soil fertility

_____c. Decreases potassium

_____d. Prevents erosion

_____e. Increases water-holding capacity of soil

14. Name four materials that can be used as mulches.

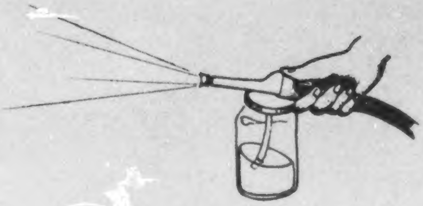
a. ____

b. ____

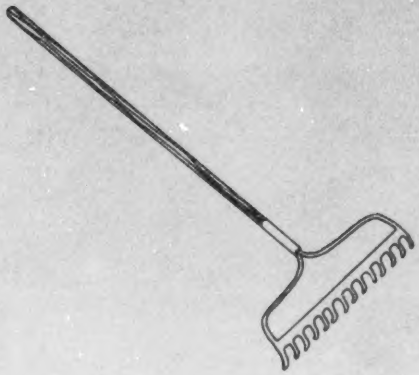
c. ____

d. ____

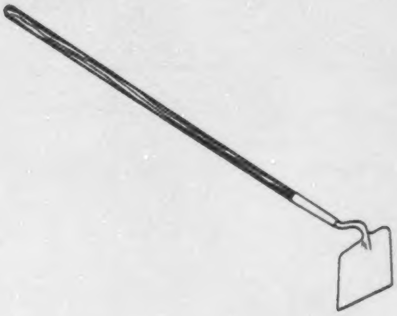
15. Identify the following tools needed in gardening.



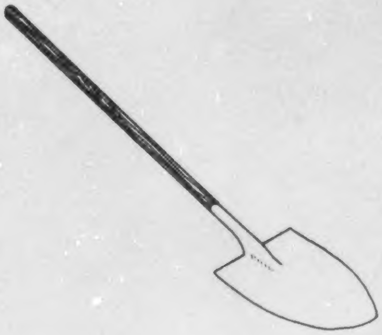
a. ____________________



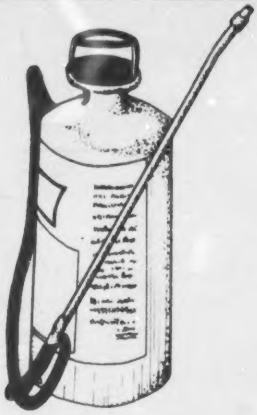
b. ____________________



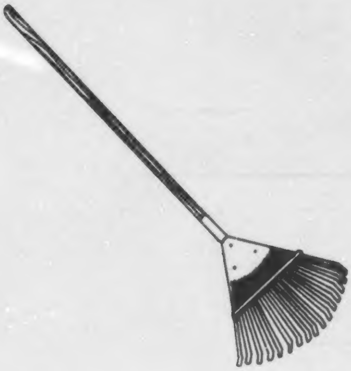
c. ____________________



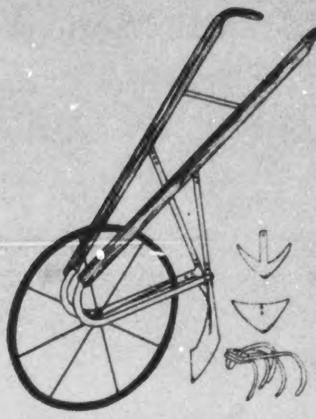
d. ____________________

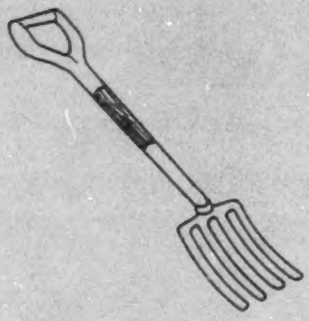


e. ____________________



f. ____________________





g. ______________________ h. ______________________

16. Select from the following list steps needed in preparing the soil for planting.

_____a. Test soil

_____b. Alter soil by adding organic matter, sand, or gypsum

_____c. Provide good drainage, aeration, and high fertility

17. Name three systems of irrigation to use in the garden.

a. ____

b. ____

c. ____

18. Select from the following list items which can be used as containers in a minigarden.

_____a. Clay pot

_____b. Plastic bag

_____c. Half-bushel basket

_____d. Metal pail

_____e. Plastic trash can

19. Name three vegetables which may be grown in a minigarden.

a. ____

b. ____

c. ____

20. Demonstrate the ability to germinate vegetable seed.

(NOTE: If this activity has not been accomplished prior to the test, ask the instructor when it should be completed.)

FUNDAMENTALS OF GARDENING
UNIT VI

ANSWERS TO TEST

1.
   - a. 6
   - b. 8
   - c. 3
   - d. 16
   - e. 15
   - f. 9
   - g. 4
   - h. 14
   - i. 1
   - j. 5
   - k. 11
   - l. 7
   - m. 2
   - n. 10
   - o. 12
   - p. 13
2. a, b, c, d, e, f
3. b, d, e
4.
   - a. Give a sense of direction
   - b. Avoid costly mistakes
5. a, d, e, f
6. Any two of the following:
   - a. Seed dealer
   - b. Seed catalog
   - c. Seed rack in stores
7. b, c, d, e
8. b, d, e, g, h, i
9.
   - a. H
   - b. C
10. a, c, d, f, g

11. a. 1
    b. 3
    c. 2, 4

12. a. 2
    b. 1
    c. 3

13. a, b, d, e

14. Any four of the following:
    a. Dry grass clippings
    b. Vegetable tops
    c. Leaves
    d. Cottonseed hulls
    e. Straw

15. a. Hose proportioner
    b. Garden rake
    c. Hoe
    d. Round-pointed shovel
    e. Compressed air sprayer
    f. Lawn rake
    g. Wheel hoe and attachments
    h. Spading fork (potato fork)

16. a, b, c

17. a. Flood
    b. Sprinkler system
    c. Trickle

18. a, b, c, d, e

19. Any three of the following:
    - a. Tomatoes
    - b. Lettuce
    - c. Radishes
    - d. Peppers
    - e. Onions
20. Performance skills evaluated to satisfaction of instructor

[redacted]

section B
Leadership.

HUMAN RELATIONS
UNIT I

UNIT OBJECTIVE

After completion of this unit, the student should be able to analyze and improve upon own personality and relationships with other persons. The student should be able to list and/or select factors dealing with physical and emotional characteristics of personality, self-respect, respect for others, and changing attitudes. This knowledge will be evidenced by completion of assignment sheets and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with human relations and self-improvement to the correct definitions.
2. Select from a list reasons for human relations training.
3. List the three sides of self.
4. Select from a list rules to follow in becoming acquainted and accepted by a group.
5. Name rules to follow when introducing others.
6. Select from a list of alternatives why most individuals are fired from their jobs.
7. Distinguish between good and poor forms of behavior.
8. Name problems that may be created by the worker who is "just putting in time."
9. Classify traits as either pleasant or irritating.
10. Select from a list the steps for creating a change in attitude.
11. Evaluate personal grooming habits.
12. Evaluate how the student gets along with others.

HUMAN RELATIONS
UNIT I

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

   A. Provide student with objective sheet.

   B. Provide student with information and assignment sheets.

   C. Discuss unit and specific objectives.

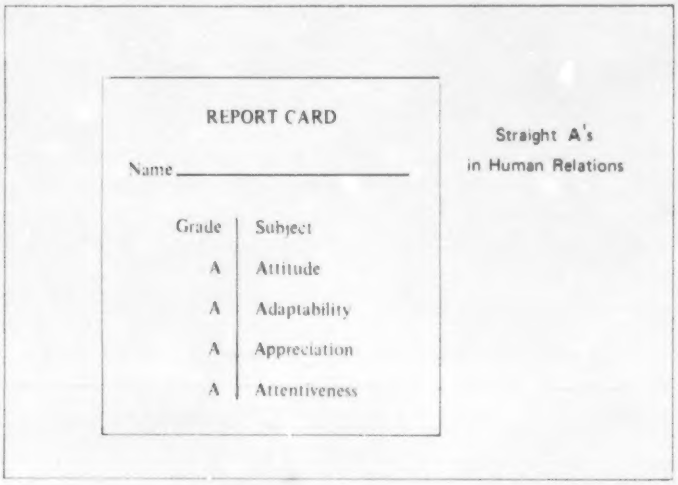
   D. Discuss information and assignment sheets.

   E. Invite guest speakers, such as local veterinarian, president of Young Farmers, representatives of Lions Club or Kiwanis, to speak about the importance of personal grooming/health habits, work habits, and a positive mental attitude.

   F. Have student role play good and poor examples of personality traits associated with job success.

   G. Show films.

   H. Prepare bulletin board, "Straight A's in Human Relations."



REPORT CARD

Name ____________________

Grade	Subject
A	Attitude
A	Adaptability
A	Appreciation
A	Attentiveness

Straight A's
in Human Relations

   I. Give test.

   J. Reteach if necessary.

II. Instructional materials:

- A. Objective sheet
- B. Information sheet
- C. Transparency masters
  - 1. TM 1--Self-Concept
  - 2. TM 2--Three Sides of Self
- D. Assignment sheets
  - 1. Assignment Sheet #1--Evaluate Personal Grooming Habits
  - 2. Assignment Sheet #2--Evaluate How You Get Along with Others
- E. Test
- F. Answers to test

III. Unit references:

A. Eggland, Steven A., and Williams, John W. *Human Relations in Business*. Dallas: South-Western Publishing Co., 1977.

B. Laird, Donald A.; Laird, Eleanor C.; Fruehling, Rosemary T.; and Swift, W. Porter. *Psychology: Human Relations and Motivation*. 5th ed. Dallas: Gregg and Community College Div./McGraw-Hill Book Co., 1975.

C. Wood, Merle W., and McKenna, Margaret A. *The Receptionist*. Dallas: Gregg Div./McGraw-Hill Book Co., 1966.

D. Archer, Fred C.; Brecker, Raymond F.; Frakes, John C.; and Stewart, Jeffrey R. *General Office Practice*. Dallas: Gregg Div./McGraw-Hill Book Co., 1968.

IV. Films:

(NOTE: Oklahoma teachers may order films from the Oklahoma Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1515 West Sixth Avenue, Stillwater, Oklahoma 74074.)

A. "Pack Your Own Chute." Available from Ramic Productions; 60 West 57th Street; New York, New York 10019.

B. "A Day in the Life of Bonnie Consolo." Available from Arthur Barr Productions, Inc.; 3490 East Foothill Boulevard; Box 5667; Pasadena, California 91107.

C. "Is It Always Right to Be Right?" Available from Roundtable Films, Inc.; Department CA 50; 113 North San Vincente Boulevard; Beverly Hills, California 90211.

HUMAN RELATIONS
UNIT I

INFORMATION SHEET

I. Terms and definitions

   A. Human relations--Getting along with people

   B. Self-discipline--Ability to control one's self at all times

   C. Tact--Ability to express ideas and opinions so they do not insult others

   D. Courtesy--Well-mannered conduct toward others; treating others as you would like to be treated

   E. Respect--Regard for the other person and his/her property and opinions

   F. Honesty--Truthfulness in all words and deeds

   G. Loyalty--Support for a cause

   H. Morale--State of mind which reflects an individual's attitudes toward her/his job, co-workers, and employers

   I. Compromise--Mutual agreement made by concessions on both sides

   J. Attitude--Feeling or emotion

   K. Success--Making progress toward achieving a worthy goal

   L. Personality--Physical, mental, and emotional characteristics that make up a whole person

   M. Self-concept--How a person feels about himself/herself (Transparency 1)

   (NOTE: Self-concept determines if a person is shy, a high achiever, a leader.)

II. Reasons for human relations training

   A. There are more service occupations today

   B. There are larger businesses today which require more group-oriented activities

   C. Research proves that good human relations increase productivity

   D. Businesses must treat all types of people equally

   (NOTE: Management, therefore, must require employees to show a positive attitude toward customers and co-workers.)

INFORMATION SHEET

E. More formality is generally required in business because an authority structure exists

Examples: You might say to a friend, "Hi! Hey, your hair looks great."

You might say to a supervisor, "Good afternoon, Ms. Jones. Your new hairstyle is very nice."

F. Sixty to seventy percent of the management duties involve human relations skills

G. Reaching one's goals often depends upon the ability to get along with others

III. Three sides of self (Transparency 2)

A. Person you think you are

B. Person others think you are

C. Person you are

IV. Rules for becoming acquainted and accepted

A. Be pleasant, cheerful, and friendly to everyone

B. Maintain proper appearance

C. Take time to know the individuals before joining cliques

D. Do not force yourself on others

E. Join company-sponsored social groups and/or teams, if invited

V. Rules for introducing others

A. Introduce man to woman

B. Introduce younger to older

C. Introduce prominent to less prominent

VI. Why ninety percent of the people are fired from their jobs--Inability to get along with others

INFORMATION SHEET

VII. Forms of behavior

(NOTE: First impressions may be right or wrong, but they are important because they are often lasting impressions.)

A. Good

1. Accuracy
2. Reliability
3. Honesty
4. Initiative
5. Dependability

B. Poor

1. Disloyalty
2. Inconsideration
3. Excessive tardiness
4. Carelessness
5. Poor attitude

VIII. Problems that may be created by the worker who is "just putting in time"

A. Low morale among other workers

B. Costly to company

IX. Traits that are either pleasant or irritating

A. Pleasant

1. Sense of humor
2. Tolerance
3. Energy
4. Enthusiasm
5. Self-confidence
6. Consideration for others
7. Doing more than own share

INFORMATION SHEET

B. Irritating

   1. Hums or whistles incessantly
   2. Gossips
   3. Chews gum or smokes thoughtlessly
   4. Interrupts frequently
   5. Uses foul language
   6. Criticizes or belittles others
   7. Says unkind things

X. Steps for creating a change in attitude

(NOTE: Some people find it helpful to memorize these steps and to apply them when they face troublesome circumstances.)

A. Realize that you can change no one but yourself

(NOTE: Therefore, a person must adjust to problem situations or get out of the problem situation.)

B. Smile

C. Say something pleasant once every hour

D. Change negative statements to positive statements

E. Change a negative problem to a positive situation

F. Keep a mental picture of the kind of person you want to be

Self-Concept

No One Can Make You Feel

Inferior Without Your Consent.

Eleanor Roosevelt

Three Sides of Self

The Person You Think You Are

The Person You Are

The Person Others Think You Are

HUMAN RELATIONS
UNIT I

ASSIGNMENT SHEET #1--EVALUATE PERSONAL GROOMING HABITS

Good grooming is essential in successful human relations. Remember, the first impression of you is based on how you look. An employer expects you to continue to "represent" the company in appearance and action. Complete the chart below and then analyze those statements checked Sometimes and Never. Answer the questions at the end of the check list.

	Always	Most of Time	Sometimes	Never
BODY CLEANLINESS AND CARE				
Do you bathe at least once daily?				
Do you bathe soon after participating in strenuous activity?				
Do you use an effective deodorant daily?				
Do you keep your undergarments fresh and clean?				
POSTURE				
Do you sit properly without slouching?				
Do you stand properly with chin up and shoulders back?				
Do you walk with your head held high and at a fast pace?				
TEETH, MOUTH, AND BREATH				
Do you have a dental checkup at least once a year?				
Do you brush your teeth at least twice daily?				
Do you use a preventative as often as necessary to avoid bad breath?				
Do you avoid "junk foods"?				

ASSIGNMENT SHEET #1

	Always	Most of Time	Sometimes	Never
Do you avoid eating what you know is harmful to your complexion?				
If you had a serious skin problem, would you consult a dermatologist?				
Do you get enough sleep each night?				
Do you have physical checkups regularly?				
Do you get sufficient physical activity?				
Are you absent no more than 1 1/4 days out of thirty because of illness?				
Do you choose clothes that are becoming to your body?				
Do you avoid extremes in styles?				
Are you aware that too much gum and sweets may be harmful to your teeth?				
HAIR				
Do you avoid combing or brushing your hair in public?				
Do you wash your hair at least once a week?				
Do you brush or comb your hair daily?				
Do you wear your hair in a style that is becoming to you?				
Do you keep your brush and comb clean?				
If you have dandruff, have you tried a medicated shampoo or seen a doctor?				

ASSIGNMENT SHEET #1

	Always	Most of Time	Sometimes	Never
HANDS				
Do you refrain from biting your fingernails?				
Are your fingernails clean and trimmed to a moderate length?				
CLOTHING				
Do you keep your clothes in good repair (no ripped seams, no missing buttons, and no pins, tape, or staples in hems)?				
Do your clothes look neat, clean, and pressed?				
Do your clothes fit properly?				
Do you wear clothes appropriate to the occasion?				
Do you wear shoes that fit properly?				
Do you keep your shoes brushed or polished and in good condition?				
(NOTE: Avoid overrun heels, scuffs, and lack of shoelaces.)				
Do you keep your outer garments free from dandruff, lint, etc.?				
Do you ever use clothing as a means to rebel against school and parental authority?				
GENERAL HEALTH AND APPEARANCE				
Do you make an effort to eat a balanced diet each day?				
Do you watch your weight carefully and try to keep it at the recommended weight for you?				

ASSIGNMENT SHEET #1

	Always	Most of Time	Sometimes	Never
FACE				
Is your makeup obvious?				
Do you avoid applying makeup in public?				
Is your skin clean and well cared for?				
Are you clean-shaven or is your beard/moustache neatly trimmed?				

1. What are the strengths in your personal grooming habits?

   a. ______________________________

   b. ______________________________

   c. ______________________________

2. What are the areas of your personal grooming habits that need improvement?

   a. ______________________________

   b. ______________________________

   c. ______________________________

HUMAN RELATIONS
UNIT I

ASSIGNMENT SHEET #2--EVALUATE HOW YOU GET ALONG WITH OTHERS

A successful person should know how to get along with others. By the results of this self-test, you will see how you are doing. Circle your answers.

1. You meet a person you immediately do not like. You would:
    a. Try to find a topic of conversation of common interest.
    b. Avoid the person.
    c. Try to put the person in her/his place.
2. You are offered a job for which you are not fitted. You would:
    a. Admit your inadequacy and offer to learn on the job.
    b. Refuse to try.
    c. Try to bluff through it.
3. When dealing with people, you:
    a. Usually smile and say something pleasant.
    b. Are nice if they are pleasant to you.
    c. Treat them impersonally.
4. You have been overcharged or undercharged in a store. You would:
    a. Ask the salesperson to recheck the bill.
    b. Pay the bill without saying anything.
    c. Tell the salesperson you have been cheated.
5. When you meet a person who is handicapped, you:
    a. Treat the person as you would anyone else.
    b. Go out of your way to be especially nice.
    c. Try to avoid the person.

ASSIGNMENT SHEET #2

6. A friend has just bought a suit which you think is unbecoming. He/she asks if you like it. You would say:

   a. "Yes, I like the color. Do you think the pants length should be changed?"

   b. "How's the weather today."

   c. "It looks terrible."

7. You honestly feel that you:

   a. Are interested in most people.

   b. Are really comfortable only with your own group.

   c. Are bored by most people.

8. In a store you are in no hurry, but the person after you is rushed. You:

   a. Suggest that the person go ahead of you.

   b. Make your selection because it is your turn.

   c. Take an extra long time just to calm the person.

9. When you meet people of different races or religions, you:

   a. Consider them as human beings much like yourself.

   b. Have a secret feeling of fear.

   c. Are convinced your way of life is superior.

10. After a picnic you find there is no trash basket. You would:

    a. Take the papers, bottles, and food home with you.

    b. Try to hide the trash on the property.

    c. Leave it on the ground.

ASSIGNMENT SHEET #2

Scoring

Give yourself 5 points for every *a* answer, 3 points for every *b* answer, and no points for *c* answers. Add up your score.

Analysis

35 to 50 points: You are very good in your relationship with others because you respect others and greet them with interest and courtesy. You are liked by your friends and those with whom you deal in a casual way.

18 to 34 points: You do very well with others most of the time, but you are sometimes self-centered and forget to put yourself in the other person's shoes. Try working toward more of those *a* answers, and you will find that living is more pleasant than it is now.

0 to 17 points: You are having trouble either because you are too shy or too aggressive. You know which! Good human relations are like anything else in life - they take practice. Select someone you admire. Analyze the person's actions; then, adapt those traits to your own personality.

HUMAN RELATIONS
UNIT I

TEST

NAME______________________________SCORE__________________

1. Match the terms on the right to the correct definitions.

______a. Mutual agreement made by concessions on both sides

______b. Getting along with people

______c. State of mind which reflects an individual's attitudes toward her/his job, co-workers, and employers

______d. Ability to control one's self at all times

______e. Support for a cause

______f. Ability to express ideas and opinions so they do not insult others

______g. Truthfulness in all words and deeds

______h. Well-mannered conduct toward others; treating others as you would like to be treated

______i. Regard for the other person and his/her property and opinions

______j. How a person feels about himself/herself

______k. Feeling or emotion

______l. Making progress toward achieving a worthy goal

______m. Physical, mental, and emotional characteristics that make up a whole person

1. Respect
2. Honesty
3. Loyalty
4. Morale
5. Compromise
6. Human relations
7. Self-discipline
8. Tact
9. Courtesy
10. Self-concept
11. Success
12. Attitude
13. Personality

2. Select from the list below reasons for human relations training by placing an "X" in the correct blanks.

_____a. There are less service occupations today

_____b. There are larger businesses today which require more group-oriented activities

_____c. Research proves that good human relations increase productivity

_____d. Businesses must treat all types of people equally

_____e. More formality is generally required in business because an authority structure exists

_____f. No more than ten to twenty percent of the management duties involve human relations skills

_____g. Reaching one's goals often depends upon the ability to get along with others

3. List the three sides of self.

a. ____________________

b. ____________________

c. ____________________

4. Select from the following list rules to follow in becoming acquainted and accepted by a group.

_____a. Force yourself on others

_____b. Maintain proper appearance

_____c. Be pleasant, cheerful, and friendly to everyone

_____d. Do not join company-sponsored social groups and/or teams

_____e. Take time to know the individuals before joining clio

5. Name three rules to follow when introducing others.

a. ____________________

b. ____________________

c. ____________________

6. Select from the list below why ninety percent of the people are fired from their jobs. Place an "X" in the blank.

   _____a. Not trained for the particular job

   _____b. Inability to get along with others

   _____c. Not interested in the work

   _____d. Late for work

7. Distinguish between good and poor forms of behavior by placing an "X" in the blanks beside the good traits.

   _____a. Poor attitude

   _____b. Honesty

   _____c. Carelessness

   _____d. Initiative

   _____e. Accuracy

   _____f. Disloyalty

8. Name two problems that may be created by the worker who is "just putting in time."

   a. ____

   b. ____

9. Classify the following traits as either pleasant or irritating. Place a "P" in the blank if the trait represents a pleasant trait or an "I" in the blank if it represents an irritating trait.

   _____a. Gossips

   _____b. Energy

   _____c. Sense of humor

   _____d. Uses foul language

   _____e. Self-confidence

   _____f. Criticizes or belittles others

   _____g. Doing more than own share

   _____h. Consideration for others

10. Select from the following list the steps for creating a change in attitude.

_____a. Realize that you can change no one but yourself

_____b. Say something unpleasant once every hour

_____c. Smile

_____d. Change positive statements to negative statements

_____e. Change a positive situation to a negative problem

_____f. Keep a mental picture of the kind of person you want to be

11. Evaluate personal grooming habits.

12. Evaluate how you get along with others.

(NOTE: If activities 11 and 12 have not been accomplished prior to the test, ask the instructor when they should be completed.)

HUMAN RELATIONS
UNIT I

ANSWERS TO TEST

1. a. 5
   b. 6
   c. 4
   d. 7
   e. 3
   f. 8
   g. 2
   h. 9
   i. 1
   j. 10
   k. 12
   l. 11
   m. 13
2. b, c, d, e, g
3. a. Person you think you are
   b. Person others think you are
   c. Person you are
4. b, c, e
5. a. Introduce man to woman
   b. Introduce younger to older
   c. Introduce prominent to less prominent
6. b
7. b, d, e

8. a. Low morale among other workers
   b. Costly to company
9. a. I
   b. P
   c. P
   d. I
   e. P
   f. I
   g. P
   h. P
10. a, c, f
11. Evaluated to satisfaction of instructor
12. Evaluated to satisfaction of instructor

JOB RESPONSIBILITIES AND DUTIES
UNIT II

UNIT OBJECTIVE

After completion of this unit, the student should be able to practice good work habits and listening skills and develop a positive mental attitude to insure job success. This knowledge will be evidenced by completion of assignment sheets and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with job responsibilities and duties to the correct definitions.
2. Name the basic factors which influence job success.
3. Match desirable employee characteristics to the correct definitions.
4. Select from a list ways to increase self-satisfaction in a job.
5. Name reasons people lose jobs.
6. Match barriers of good communications to the correct definitions/descriptions.
7. Select from a list methods to improve listening habits.
8. Evaluate her/his ability to get along with others.
9. Evaluate personal habits associated with job success.

JOB RESPONSIBILITIES AND DUTIES
UNIT II

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

A. Provide student with objective sheet.

B. Provide student with information and assignment sheets.

C. Discuss unit and specific objectives.

D. Discuss information and assignment sheets.

E. Reinforce objective six: bypassing, allness, name-calling, labeling.

Examples:

Have students think of different words that mean the same as the three words below.

1. Money __________ __________ __________
2. Home __________ __________ __________
3. Car __________ __________ __________

Role play or observe a dialogue between two people having a problem, e.g., employer-employee, teacher-student, parent-child, What words of allness are used that seem to further complicate the problem?

Brainstorm and list "labels" given to people, e.g., *Smokey* is a highway patrol officer in a patrol car; *troublemaker* is a person who appears to be frequently involved in controversy, an *animal* is a person lacking in manners; *aggie* is a person engaged in agriculture. What human relations problems stem from "living up to a label" and "living down a label"?

Compare feelings and reactions to emotionally loaded words.

Examples: Garbage collector vs sanitation worker; banker vs farm loan supervisor; sod-buster vs agronomist; farmer vs agriculturist; lies vs fibs; hot rod vs sports car; fired vs asked to leave; pop quiz vs unscheduled test

F. Discuss Assignment Sheet #1 with student, stressing that all the questions need not be answered.

G. Give test.

H. Reteach if necessary.

II. Instructional materials:

A. Objective sheet

B. Information sheet

C. Assignment sheets

1. Assignment Sheet #1--Evaluate Your Ability to Get Along With Others

2. Assignment Sheet #2--Evaluate Personal Habits Associated With Job Success

D. Test

E. Answers to test

III. Unit references:

A. Eggland, Steven A., and Williams, John W. *Human Relations in Business.* Dallas: South-Western Publishing Co., 1977.

B. Russon, Allien R. *Personality Development for Business.* 4th ed. Dallas: South-Western Publishing Co., 1973.

C. Laird, Donald A.; Laird, Eleanor C.; Fruehling, Rosemary T.; and Swift, W. Porter. *Psychology: Human Relations and Motivation.* 5th ed. Dallas: Gregg and Community College Div./McGraw-Hill Book Co., 1975.

D. Baltus, Rita K. *Personal Psychology for Life and Work.* Dallas: McGraw-Hill Book Co., 1976.

JOB RESPONSIBILITIES AND DUTIES
UNIT II

INFORMATION SHEET

I. Terms and definitions

   A. Technical knowledge--What you know about the job itself

      Examples: Mechanic must know how engines operate; veterinarian must be able to practice care of animals; welder must know how to work with different types of metals

   B. Human relations--Continuous process of getting along with people

   C. Attitude--Way in which one acts and feels about people, things, and ideas

      (NOTE: Once you have a job the most important factor in keeping it and succeeding in it is your ATTITUDE! Your attitude is expressed in how well you get along with others.)

      Examples: Willingness to work hard and to be ambitious; trying to be pleasant to others; trying to be courteous and respectful to those with whom you work; avoiding being a smart aleck or having a chip on your shoulder; caring about others

   D. Job--Type of work which an individual does

   E. Communication--Sharing of a message or an idea which results in a high amount of understanding between the sender and the receiver of the message

   F. Learning attitude--On-going alertness for any departure from present knowledge or training

      (NOTE: How can this new method, system, equipment, and/or routine help your job function? Keep a positive attitude.)

   G. Job-enrichment program--Opportunity designed to give a worker a sense of accomplishment and satisfaction with his/her work

II. Basic factors which influence job success

   A. Technical knowledge

   B. Human relations

      Examples: Attitude, communication, personality, personal health and grooming, practice of work ethics

INFORMATION SHEET

III. Desirable employee characteristics

A. Dependability--Doing what one has said will be done and completing duties and assignments

Examples: Work regularly; be on time; take only the time allowed for lunch and breaks; do all of own work; follow instructions

B. Enthusiasm--Being eager to help or to take part in some activity

Examples: Show pride in doing work; look alert; do more than your share when time permits

C. Initiative--Doing things without being told

Examples: Use slack moments or periods to learn more about job; show an interest in learning and doing a good job

D. Honesty--Being truthful in all things

Examples: Give truthful information to employers, customers, and/or co-workers; keep promises; avoid wasting time; do not take supplies home for personal use

E. Loyalty--Being able to keep confidences and avoid gossip about work matters

Examples: Avoid public criticism of employer, supervisor, or co-workers; do not discuss wages or raises with other employees

F. Cooperation--Working in harmony with others

Examples: Observe rules and regulations; help others when possible; work well with co-workers, supervisor, and employer

G. Adaptability--Adjusting easily to new situations

Examples: Accept change(s) without complaint, resentment, or fear of personal threat; learn new procedures and service information

H. Courtesy--Being polite and acting with good manners

Examples: Show respect for co-workers, employer, and customers; return promptly from lunch and breaks so co-workers can have their rest periods; speak pleasantly

INFORMATION SHEET

I. Patience--Taking time to do things right

Examples: Try to understand the needs and desires of others; control anger and frustration

(NOTE: Why is there never time to do a job right the first time, but there is always time to do a job over?!?)

J. Self-control--Being able to control one's temper and emotions

Examples: Accept criticism without feeling personally threatened; maintain poise and stay calm

K. Tact--Being able to say the right thing at the right time

Examples: Avoid correcting customers, clients, patrons, co-workers, and employers in a disagreeable way; learn to take care of complaints

IV. Ways to increase self-satisfaction in a job

A. Keep a learning attitude

B. Learn to be a winner on the job

Examples: Prepare for the next higher job; practice human relations skills; learn how and when to speak up; think before you speak

C. Get yourself together

Examples: Avoid becoming part of cliques; avoid reacting to office characters; don't become an office character; have an emotional outlet; take your emotional temperature

D. Want to improve or share

E. Participate in job enrichment program

V. Reasons people lose jobs

A. Technical knowledge

(NOTE: Lack of or low ability to execute skills required in a particular job can account for loss of employment.)

B. Economic conditions

Examples: Depression; decline of opportunities due to exhaustion of natural resources (e.g. farmers, panners for gold, oil-field workers in a given area); change in technology (e.g. blacksmiths, "icemen")

INFORMATION SHEET

C. Human relations

(NOTE: The reason ninety percent of the people are fired from their jobs is the inability to get along with others.)

Examples: Poor attitude, ill health, poor grooming habits

D. Low observance of or low dedication to work ethics

VI. Barriers to good communications

A. Bypassing--Result of people forgetting or overlooking that a single word or expression may have several different meanings

(NOTE: Bypassing can be avoided by repeating the message/instructions, e.g., I understand that . . .)

B. Allness--Belief that what is said is absolute, complete, certain of the person making the statement

(NOTE: The tone of allness is suggested by such words as *always, ever,* and *never*.)

Examples: You *never* remember to . . .

You *always* . . .

Can't you *ever* remember . . .

C. Misuse of language--Problem resulting from labeling or name-calling and emotionally loaded words

D. Poor listening skills--Lack of ability to think about what is being said

VII. How to improve listening habits

(NOTE: Good listening habits will improve human relations. By listening to others carefully, you silently tell them you care about what they have to say.)

A. Encourage others to talk

B. Use nonverbal actions to encourage the person who is talking

Examples: Look at the person who is talking; nod as you hear the meaning of what is being said; say uh-huh and hmmm

INFORMATION SHEET

C. Take advantage of your fast-working mind; use the time to repeat and rephrase what the person has said

(NOTE: People can only speak about 125 words per minute. Your mind can process five times as much in the same time period.)

D. Ask the speaker to repeat what was said when your mind wanders

E. DON'T INTERRUPT

(NOTE: Interrupting someone can cause hard feelings. You are not on a quiz show; avoid blurting answers before the speaker has finished!)

F. Listen for feelings as well as for facts

(NOTE: By listening for feelings you will become more aware of your own emotions; hence, you can control them. Also, as you listen for both feelings and facts you gain a better understanding of the speaker's message.)

JOB RESPONSIBILITIES AND DUTIES
UNIT II

ASSIGNMENT SHEET #1--EVALUATE YOUR ABILITY TO GET ALONG WITH OTHERS

A successful employee should know how to get along with others. From the results of this self-test, you will see how you are doing. The test is designed to help you discover if you have qualities that cause others to like you. Answer each question by circling YES or NO at the end of each question.

1. If you make a promise, do you always keep it? YES NO
2. If someone (a friend or a co-worker or a member of your family) is in need of help, do you give that help cheerfully? YES NO
3. Are you frequently witty in a sarcastic way? YES NO
4. Do you have a tendency to gain attention by "topping" the remark made by the previous speaker in a conversation? YES NO
5. Are you usually ill at ease with strangers? YES NO
6. Are you critical of others when you feel they are at fault? YES NO
7. Can you usually avoid being bossy? YES NO
8. Are you able to avoid ridiculing other people when they are not present? YES NO
9. Do you often laugh at the mistakes of others? YES NO
10. When others make mistakes (in fact, grammar, or pronunciation) do you correct them? YES NO
11. Do you smile easily? YES NO
12. Are you able to praise and compliment other people easily? YES NO
13. Do you frequently try to reform other people? YES NO
14. Are you able to keep your personal troubles to yourself? YES NO
15. Are you suspicious of other people's motives? YES NO
16. Do you frequently borrow the belongings of others? YES NO

ASSIGNMENT SHEET #1

17. Do you enjoy gossip? YES NO

18. Are you able to keep out of other people's business most of the time? YES NO

19. Do you avoid talking about yourself, your belongings, and your successes most of the time? YES NO

20. Do you ever use belittling words when referring to those who differ from you in religion, race, politics, or beliefs? YES NO

JOB RESPONSIBILITIES AND DUTIES
UNIT II

ASSIGNMENT SHEET #2--EVALUATE PERSONAL HABITS ASSOCIATED WITH JOB SUCCESS

Good habits are necessary in order to establish good human relations and a good relationship with co-workers, employer, and customers. Answer each question by circling YES or NO at the end of each question.

(NOTE: If you have not yet been employed, base your evaluation on "work situations" in classroom settings.)

CO-WORKERS (OR PEERS)

Do you do your own work and not leave it for someone else to do?	YES	NO
Do you clean up after yourself?	YES	NO
Are you willing to learn from others about how to do a job better?	YES	NO
Do you contribute to morale and team spirit at place of business?	YES	NO
Do you learn names of people with whom you work as soon as possible?	YES	NO
Do you take a sincere interest in co-workers, their families, and their interests?	YES	NO
Are you a good listener?	YES	NO
Do you admit mistakes without making excuses?	YES	NO
Do you assume blame for things that are your fault?	YES	NO
Do you avoid gossip?	YES	NO
Do you support co-workers?	YES	NO

EMPLOYER (OR TEACHER)

Are you cheerful?	YES	NO
Do you feel your job is a privilege, not a right?	YES	NO
Do you try always to do the best you can?	YES	NO
Do you know your job?	YES	NO

ASSIGNMENT SHEET #2

Are you on the job unless excused?	YES	NO
Are you on time and ready to work?	YES	NO

(NOTE: Do a day's work for a day's pay!)

Do you try to avoid waste of all kinds (materials, time, equipment)?	YES	NO
Do you look for a better way to do the job?	YES	NO
Do you tell the truth and are you sincere?	YES	NO
Do you ask questions when you need help?	YES	NO
Do you try to see employer's side when there is a problem?	YES	NO

CUSTOMERS (OR ANYONE WITH WHOM YOU'RE WORKING)

Do you know what is expected of you and do you do your job well?	YES	NO
Do you give business-like treatment to customers?	YES	NO
Do you keep promises made to customers?	YES	NO
Are you polite to customers?	YES	NO
Do you recognize customers as buyers of your service and give them their money's worth?	YES	NO
Are you sincere?	YES	NO
Do you smile?	YES	NO
Are you friendly, interested, and sympathetic?	YES	NO
Do you gain the customer's confidence and listen?	YES	NO
Do you try not to rush the customer?	YES	NO
Do you avoid arguing with an angry customer?	YES	NO
Do you avoid comments that might upset a customer?	YES	NO
Do you refer matters which you can not handle to supervisor?	YES	NO

ASSIGNMENT SHEET #2

Do you treat each customer as an individual?	YES	NO
Do you take pride in winning a customer's friendship?	YES	NO

1. What do you feel are your strengths in personal habits associated with job success?

____

____

____

____

____

2. What do you feel are your weaknesses in personal habits associated with job success?

____

____

____

____

____

# JOB RESPONSIBILITIES AND DUTIES
UNIT II

TEST

NAME ______________________________ SCORE ____________

1. Match the terms on the right to the correct definitions.

_____a. Continuous process of getting along with people

_____b. Way in which one acts and feels about people, things, and ideas

_____c. Type of work which an individual does

_____d. What you know about the job itself

_____e. Sharing of a message or an idea which results in a high amount of understanding between the sender and the receiver of the message

_____f. Opportunity designed to give a worker a sense of accomplishment and satisfaction with his/her work

_____g. On-going alertness for any departure from present knowledge or training

1. Technical knowledge
2. Human relations
3. Attitude
4. Job
5. Communication
6. Learning attitude
7. Job-enrichment program

2. Name the two basic factors which influence job success.

a. ______________________________

b. ______________________________

3. Match the desirable employee characteristics on the right to the correct definitions. Place the appropriate numbers in the blanks provided.

______a. Working in harmony with others

______b. Being truthful in all things

______c. Being eager to help or to take part in some activity

______d. Adjusting easily to new situations

______e. Being able to say the right thing at the right time

______f. Taking time to do things right

______g. Doing what one has said will be done and completing duties and assignments

______h. Doing things without being told

______i. Being able to keep confidences and avoid gossip about work matters

______j. Being polite and acting with good manners

______k. Being able to control one's temper and emotions

1. Dependability
2. Enthusiasm
3. Initiative
4. Honesty
5. Loyalty
6. Cooperation
7. Adaptability
8. Courtesy
9. Patience
10. Self control
11. Tact.

4. Select from the following list ways to increase self-satisfaction in a job. Place an "X" in the appropriate spaces.

______a. Learn to be a good loser on the job

______b. Keep a learning attitude

______c. Participate in job enrichment program

______d. Avoid improvement or sharing

______e. Get yourself together

5. Name two reasons people lose jobs.

a. ____

b. ____

6. Match barriers of good communications to the correct definitions/descriptions.

_____a. Problem resulting from labeling or name-calling and emotionally loaded words

_____b. Belief that what is said is absolute, complete, certain by the person who said the statement

_____c. Result of people forgetting or overlooking that a single word or expression may have several different meanings

_____d. Lack of ability to think about what is being said

1. Bypassing
2. Allness
3. Misuse of language
4. Poor listening skills

7. Select from the following list methods to improve listening habits.

_____a. Use nonverbal actions to encourage the person who is talking

_____b. Encourage others to listen while you talk

_____c. Take advantage of your fast-working mind; use time to repeat and rephrase what the person has said

_____d. Interrupt speaker

_____e. Ask the speaker to repeat what was said when your mind wanders

_____f. Listen for feelings as well as for facts

8. Evaluate your ability to get along with others.

9. Evaluate personal habits associated with job success.

(NOTE: If activities 8 and 9 have not been accomplished prior to the test, ask the instructor when they should be completed.)

JOB RESPONSIBILITIES AND DUTIES
UNIT II

ANSWERS TO TEST

1. a. 2

   b. 3

   c. 4

   d. 1

   e. 5

   f. 7

   g. 6

2. a. Technical knowledge

   b. Human relations

3. a. 6

   b. 4

   c. 2

   d. 7

   e. 11

   f. 9

   g. 1

   h. 3

   i. 5

   j. 8

   k. 10

4. b, c, e

5. Any two of the following:
   a. Technical knowledge
   b. Economic conditions
   c. Human relations
   d. Low observance of or low dedication to work ethics
6. a. 3
   b. 2
   c. 1
   d. 4
7. a, c, e, f
8. Evaluated to the satisfaction of the instructor
9. Evaluated to the satisfaction of the instructor

JOB APPLICATIONS AND INTERVIEW
UNIT III

UNIT OBJECTIVE

After completion of this unit, the student should be able to locate employment opportunities and practice appropriate conduct during the job interview. The student should be able to properly complete an application for employment and prepare a resumé. This knowledge will be evidenced by completion of assignment sheets and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with job applications and interviews to the correct definitions.
2. Name sources for locating employment opportunities.
3. Match types of employment agencies to correct descriptions.
4. Distinguish between services provided for employers and employees by public and private employment agencies.
5. Select from a list guidelines for dressing for an interview.
6. Name job-training sources.
7. Select from a list items which an applicant may need to prepare when applying for a job.
8. Prepare a resumé.
9. Write a letter of application.
10. Complete a job application form.
11. Make an appointment by phone.
12. Participate in a job interview.

1[illegible] Write a follow-up letter.

JOB APPLICATIONS AND INTERVIEW
UNIT III

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

  A. Provide student with objective sheet.

  B. Provide student with information and assignment sheets.

  C. Discuss unit and specific objectives.

  D. Collect newspaper ad sections for student to use in completing assignment sheets.

  E. Obtain actual letters of application and resumés to show student.

  F. Invite resource person (e.g., business owner, superintendent, or principal) to discuss "What I look for on application letters, resumés, employment application forms, and follow-up devices."

  G. Arrange for a teletrainer from phone company in your area to facilitate learning process in Assignment Sheet #4.

  H. Invite representative from employment agency to explain how employment agencies can benefit student in locating employment.

  (NOTE: A representative from the state employment service will come to the school without charge.)

  I. Give test.

  J. Reteach if necessary.

II. Instructional materials:

  A. Objective sheet

  B. Information sheet

  C. Assignment sheets

    1. Assignment Sheet #1--Prepare a Resumé

    2. Assignment Sheet #2--Write a Letter of Application

    3. Assignment Sheet #3--Complete a Job Application Form

4. Assignment Sheet #4--Make an Appointment by Phone
5. Assignment Sheet #5--Participate in a Job Interview.
6. Assignment Sheet #6--Write a Follow-Up Letter.

D. Test

E. Answers to test

III. Unit references:

A. Nelson, Frank, and Robyler, Jim. *Distributive Education II: Course of Study*. Stillwater: Oklahoma State Department of Vocational and Technical Education, 1976.

B. Sawatzky, Joyce; Clements, Irene; and Coffey, Judy. rev. ed. *Home Economics I: Basic Core.* Stillwater: Oklahoma State Department of Vocational and Technical Education, 1977.

C. Allen, Cliff. "About Getting A Job." *Practical Family Life.* Greenfield, Massachusetts: Channing L. Bete, Inc., 1977.

D. Allen, Cliff. "After High School--What?" *Practical Family Life.* Greenfield, Massachusetts: Channing L. Bete, Inc., 1977.

E. Kimbrell, Grady, and Vineyard, Ben S. *Succeeding in the World of Work.* Bloomington, Illinois: McKnight Publishing Co., 1975.

F. Feingold, S. Norman, and Swerdloff, Solo. *Occupations and Careers.* St. Louis: Webster Div./McGraw-Hill Book Co., 1969.

IV. Additional references:

(NOTE: Oklahoma vocational teachers may order films from the State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1515 West Sixth Avenue, Stillwater, Oklahoma 74074. Out-of-state teachers may purchase and/or rent materials from the addresses listed below.)

A. "Applying for a Job." Available from Encyclopedia Britannica Educational Corporation, 425 North Michigan Avenue, Chicago, Illinois 60611.

B. "Getting a Job Is a Job." Available from Dibie-Dash Productions, 4949 Hollywood Boulevard, Suite 217, Hollywood, California 90028.

C. "Your Job: Finding the Right One." Available from Coronet Films, Coronet Building, 63 East South Water Street, Chicago, Illinois 60601.

D. "Your Job: Applying for It." Available from Coronet Films, Coronet Building, 63 East South Water Street, Chicago, Illinois 60601.

E. "I Guess I Got the Job." Available from McGraw-Hill Films, 1221 Avenue of the Americas, New York, New York 10020.

F. Pamphlets

1. *How to Get and Hold the Right Job.*
2. *How to Prepare Yourself for Job Interviews.*
3. *How to "Sell Yourself" to an Employer.*

   (NOTE: These pamphlets are available from the nearest state employment service office.)

4. *Appointment with Tomorrow.* Available from Vaseco Inc., 2301 Classen Boulevard, P. O. Box 60274, Oklahoma City, Oklahoma 73106.

JOB APPLICATIONS AND INTERVIEW
UNIT III

INFORMATION SHEET

I. Terms and definitions

A. Interview--Meeting of employer and job applicant for purpose of evaluation and questioning

B. Resumé--Written statement or summary of information about an individual that would be of interest to a prospective employer; personal data sheet

C. Blind ad--Classified advertising that does not identify the advertiser

(NOTE: Applicant is asked to send a letter of application and resumé to a post office box number or to call a certain number.)

Examples:

Cotton picker operators needed. People with experience on combine acceptable. $3.50 an hour, long hours, work in Arizona. Oct. 1 to March 1. 934-8234.

General ranch hand need exper with all farm machinery & dozer, 918-366-2853 or 749-3642.

Dog groomers and trainees needed due to expanding business. Call 555-2992.

Husband & wife for dairy work. 405-294-5876.

Experienced ranch manager needed. Must be qualified to artificially inseminate, calve out cows, and look after livestock. House and utilities furnished. Send resume' and references to Tim Brise, Box 899, Eufaula, OK 74900, Call 912-674-3920.

D. Help-wanted ad--Advertisement listing the kind of job available and the required qualifications

Example:

AGRICULTURAL & COMMERCIAL
SALES AGENTS NEEDED

Top company in lubrication field has opening for experienced and inexperienced sales agents with good automobiles. Above average income; fulltime; repeat customers. Pay full commission plus special bonus program. Sales experience, knowledge of tractors and machinery helpful. Special training given at company expense. For personal interview, airmail qualifications, name, address, phone number to James Tompson, Dept. 5H3, Box 52399, Dallas, Texas 74398.

Kennel help wanted. Part or full time. Apply in person. Nan's Country Club for Pets. 1/2 mi S of I-40 on Mehan Rd.

Need framing carpenters, 2 yrs exper, must have own tools & trans. 548-6222 or 766-4370.

ARC WELDERS

experienced, do own fit-up. Read blueprint. Moving into new modern facilities. Apply Lightemup Supply & Machine Works. 546 SE 4.

E. Employment/situation wanted ad--Classified advertisement placed by individual seeking employment and listing individual's qualifications

INFORMATION SHEET

Example:

POSITIONS WANTED

YOUNG VETERINARIAN desires to establish mixed practice in progressive dairy community. End military commitment in January 1978. Contact DONALD F. BILL, DVM, 1018 West Stuart, Sunny Meadows, Minnesota 54322. 608-837-2311. 17-2

SINGLE WOMAN, 21, wants work on dairy farm. Born and raised on dairy farm. Two years herd management and farm mechanic. SANDY BLAKELEY, 18110 12th Avenue, Connors, Michigan 49403.

YOUNG, AGGRESSIVE, hardworking couple desires opening with responsible person to work into partnership. Highly qualified in dairy nutrition, A.I., record keeping, management. Acquainted with all phases of farming, exceptional in forage. Available immediately. CALL 734-918-5427.

F. Legible--Capable of being read; clear

G. Employer--Person who hires another for wages

H. Equal opportunity employer--Employer who is making a special effort to assure that no form of discrimination is practiced

I. Employee--Person employed by another usually for wages or salary and in a position below the executive level

J. Personnel management--Area of retailing related to the selection, training, placement, advancement, and welfare of all employees

K. Employment--Activity in which one engages or is employed; work

L. Application form--Printed form on which the job applicant records his/her personal history, job experience, education, and references

M. Hiring hall--Union-maintained office where members can find out about possible job openings

N. Apprenticeship--Program that provides on-the-job skill training with a skilled worker

O. Employment agency--Business that is designed to help individuals find employment

II. Sources for locating employment opportunities

A. Other people

(NOTE: Tell people that you are job-hunting!! The more people that know you are interested in obtaining a job, the better chance you have in locating employment.)

Examples: Friends, teachers, counselors, neighbors, farmers, business people, and people employed in the type of work you want

INFORMATION SHEET

- B. Newspapers

  (NOTE: Use situation-wanted columns, help-wanted ads, general listings by employment agencies, and blind ads.)

- C. Former employers

  (NOTE: Ask for references to other business people and for letters of recommendation.)

- D. Window signs

  (NOTE: Watch for signs in store windows and inquire about the job openings.)

- E. Employment agencies

  (NOTE: Employment agencies request applicants to have counseling, take vocational tests, make out application forms, and pay a fee if job is located and secured through a private agency.)

- F. Unions

  (NOTE: Visit a hiring hall to learn about apprenticeship programs.)

- G. Employment offices of private business firms
- H. School placement service
- I. Federal agencies

III. Types of employment agencies

- A. Private employment agency
  - [illegible]. Charges a placement fee for service
  - 2. Collects fee when employment is secured
  - 3. Requests contract between you and the agency
  - 4. Is controlled by state law
- B. Public employment agency
  - 1. Does not charge a placement fee for services
  - 2. Is supported by state or federal government funds

INFORMATION SHEET

C. School placement office

    1. Offers job information

    2. Offers career guidance through counselors and teachers

IV. Services provided by public and private employment agencies

A. For employees

    1. Finds jobs for workers

    2. Provides vocational counseling

    3. Arranges interviews

    4. Gives aptitude and ability/interest tests

B. For employers

    1. Finds workers for jobs

    2. Arranges interviews

    3. Matches qualified applicants to job vacancies

V. Guidelines for dressing for an interview

A. Job-related

    1. Kind of job

    (NOTE: You might dress differently to interview for an inside job than you would for an outside job. A "rule of thumb" for any job interview is to dress better for the interview than you would for a day on the job.)

    2. Salary range

    (NOTE: Dress to fit the salary range for which you are applying.)

    3. Appearance of other workers

    4. Age of the interviewer

    (NOTE: Generally, older persons prefer more conservative clothing.)

INFORMATION SHEET

B. Personal

1. Coordination of clothing

   (NOTE: Consider colors, patterns, fabrics, and suitable styles for shape of face and body structure.)

2. Conservative

   (NOTE: In most cases, avoid high-fashion items and fads!)

   Examples: Avoid strong colognes or aftershaves; avoid wearing sunglasses during the interview

3. Modest

   Examples: Buttoned shirt/blouse, appropriate skirt/pant length, well-fitting clothes (not too tight!)

4. Well-groomed

   Examples: Clean, simply-styled hair; clean nails; clean clothing

VI. Job-training sources

A. On-the-job training

   Example: OJT

B. High school equivalency certificate

   Example: GED

C. Extension courses

D. Community and junior colleges

E. Vocational schools

F. Special schools

   Examples: Secretarial, computer, auctioneering, meat cutting, farm and ranch management

G. Apprenticeship programs

INFORMATION SHEET

VII. Items which applicant may need to prepare when applying for a job

- A. Personal data sheet (resumé)
- B. Letter of application
- C. Application form
- D. Follow-up letter

JOB APPLICATIONS AND INTERVIEW
UNIT III

ASSIGNMENT SHEET #1--PREPARE A RESUMÉ

1. Write a resumé to be included with your letter of application. Select the style of your choice or use the example on the following page as a guide.

2. Make sure your resumé meets the standards below.

   a. Logically organized

   b. Neatly typed

   c. Error free

   d. In outline form

   e. Limited to one page, if possible

   f. Honest about qualifications and experiences

3. Include the following information in your resumé.

   a. Name, address, phone number

   b. Desired position

   c. Personal information

      (NOTE: Do not include birthplace, age, health, height, weight, sex, marital status, photo, salary, or reasons for leaving job. Avoid religious and political affiliations. The whole point of the resumé is to get employers interested to meet you in person. The above information may or may not come out in the interview. However, by not including this information there is little or no chance for discrimination on any basis. Of course, if you feel it would be to YOUR advantage to include any of this information, then do so.)

   d. Educational information

      1) Name and address of schools attended

      2) Dates you attended schools

      3) Subjects studied

      4) Awards and activities

ASSIGNMENT SHEET #1

e. Work experience

   1) Name and address of company

   2) Length of time worked

   3) Brief description of duties and responsibilities

f. Special skills and interests

g. Personal references

(NOTE: Be sure to obtain permission before using someone as a reference.)

ASSIGNMENT SHEET #1

Sample Resumé
Personal Data Sheet

NAME: Pat Simmons
ADDRESS: 702 Arapaho
Stillwater, Oklahoma 74074

TELEPHONE: 377-2000

AGE: 18 years
WEIGHT: 115 lbs
HEALTH: Excellent

SUBJECTS STUDIED:

Vocational Agriculture: 7 semesters
Business Arithmetic: 1 semester
Greenhouse Management: 1 semester
Horticulture: 2 semesters
Bookkeeping: 2 semesters

STUDENT ACTIVITIES:

National Honor Society
Vice-President, Future Farmers of America
Secretary, Senior Class
Member of Senior Prom Committee

SPECIAL SKILLS:

Trained in the operation of tractors and reel mowers, hand mowers, fertilizer spreaders, and the application of herbicides

WORK EXPERIENCE:

General yard worker for Stillwater Summer Playground for two summer vacations Did general lawn mowing, trimming of grass and hedges, greeted visitors

REFERENCES:

Mr. Raymond Fox, Instructor
Vocational Agriculture
Stillwater High School
1200 North Main
Stillwater, Oklahoma 74074

Mr. Gus Jones, Director
Summer Work Program
City of Stillwater
705 South Washington
Stillwater, Oklahoma 74074

Ms. D. E. Applesauce
English Teacher
Stillwater High School
1200 North Main
Stillwater, Oklahoma 74074

JOB APPLICATIONS AND INTERVIEW
UNIT III

ASSIGNMENT SHEET #2--WRITE A LETTER OF APPLICATION

1. Write a letter of application to a prospective employer using the letter style of your choice. Use the letter on the following page as a guide in composing your letter.

2. Make sure your letter meets the standards below.

   a. Attractive form

   b. Logical arrangement of information

   c. Free from smudges or typographical errors

   d. Free from spelling or grammatical errors

   e. Brief and to the point

      (NOTE: Leave the details for the resumé.)

   f. Positive in tone

   g. Ideas clearly expressed

3. Include the following information in your letter of application.

   a. Position for which you are applying

   b. Reason for interest in position and firm

   c. How your training fits employer's needs

   d. Explanation of your personal qualifications

   e. Mention of resumé

   f. Request for interview

      (NOTE: Be sure to include your address and the phone number where you can be reached.)

ASSIGNMENT SHEET #2

Sample Letter of Application

702 Arapaho
Stillwater, Oklahoma 74074
October 3, 1977

Joe Smith
Personnel Manager
Stillwater Country Club
1515 West Sixth Avenue
Stillwater, Oklahoma 74074

Dear Mr. Smith:

Please consider me for the greensworker position which you advertised in the Stillwater News-Press.

The skills I have learned in my high school vocational agriculture courses should qualify me for this position. I have had experience in operating a power lawn mower, taking soil samples, and applying fertilizers.

This fall I will be enrolled in the cooperative vocational agriculture program at Stillwater High School. I feel that the experiences gained in this program will help me to be a valuable addition to your firm. Mr. Charles Black will be my teacher-coordinator. A more complete description of my qualifications is given on the enclosed resumé.

May I come for an interview at your convenience anytime after school? I can be reached by phone at 377-2000 after 3:30 p.m. or by mail at 702 Arapaho, Stillwater, Oklahoma 74074.

Sincerely,

Pat Simmons

Pat Simmons

Enclosure

JOB APPLICATIONS AND INTERVIEW
UNIT III

ASSIGNMENT SHEET #3--COMPLETE A JOB APPLICATION FORM

Complete the application form on the following pages, applying the rules given below.

1. Look over entire application form before you begin.

   (NOTE: Watch for special instructions to print or write in own handwriting.)

2. Follow instructions carefully and exactly.
3. Write neatly and legibly.
4. Write in ink unless otherwise requested.

   (NOTE: If you make an error, mark through it with one neat line.)

5. Try to give all facts for each question.
6. Keep answers brief.
7. Fill in all blanks.
   a. If question doesn't pertain to you, write *not applicable* or *N/A*.
   b. If there is no answer, write *none* or --- (a line).
   c. If asked what salary you expect, write *open* or *scale* if you are not sure what is appropriate.
8. Know complete names, titles, addresses, and phone numbers of all references and former employers.
9. Check form for completeness, accuracy, and correct spelling when finished.
10. Be sure you have included any special abilities or accomplishments.

    (NOTE: Remember, you are trying to sell yourself by the information given on the form.)

Ag III - 69-B

"WE ARE AN EQUAL OPPORTUNITY EMPLOYMENT COMPANY. WE ARE DEDICATED TO A POLICY OF NON-DISCRIMINATION IN EMPLOYMENT ON ANY BASIS INCLUDING RACE, CREED, COLOR, AGE, SEX, RELIGION OR NATIONAL ORIGIN: OR PHYSICAL DEFECTS"

APPLICATION FOR EMPLOYMENT

PERSONAL INFORMATION

DATE

NAME
LAST FIRST MIDDLE

PRESENT ADDRESS
STREET CITY STATE ZIP

PERMANENT ADDRESS
STREET CITY STATE ZIP

PHONE NO. SOCIAL SECURITY NUMBER

REFERRED BY

EMPLOYMENT DESIRED

POSITION DATE YOU CAN START SALARY DESIRED

ARE YOU EMPLOYED NOW? IF SO MAY WE INQUIRE OF YOUR PRESENT EMPLOYER

EVER APPLIED TO THIS COMPANY BEFORE? WHERE WHEN

EDUCATION	NAME AND LOCATION OF SCHOOL	YEARS ATTENDED	DATE GRADUATED	SUBJECTS STUDIED
GRAMMAR SCHOOL				
HIGH SCHOOL				
COLLEGE				
TRADE, BUSINESS OR CORRESPONDENCE SCHOOL				

SUBJECTS OF SPECIAL STUDY OR RESEARCH WORK

U. S. MILITARY OR NAVAL SERVICE RANK PRESENT MEMBERSHIP IN NATIONAL GUARD OR RESERVES

ACTIVITIES OTHER THAN RELIGIOUS (CIVIC, ATHLETIC, FRATERNAL, ETC.)

EXCLUDE ORGANIZATIONS, THE NAME OR CHARACTER OF WHICH INDICATES THE RACE, CREED, COLOR OR NATIONAL ORIGIN OF ITS MEMBERS.

(CONTINUED ON OTHER SIDE)

LAST

FIRST

MIDDLE

70-B

FORMER EMPLOYERS (LIST BELOW LAST FOUR EMPLOYERS, STARTING WITH LAST ONE FIRST.)

DATE MONTH AND YEAR	NAME AND ADDRESS OF EMPLOYER	SALARY	POSITION	REASON FOR LEAVING
FROM				
TO				
FROM				
TO				
FROM				
TO				
FROM				
TO				

REFERENCES: GIVE BELOW THE NAMES OF TWO PERSONS NOT RELATED TO YOU, WHOM YOU HAVE KNOWN AT LEAST ONE YEAR.

NAME	ADDRESS	BUSINESS	YEARS ACQUAINTED
1			
2			

PHYSICAL RECORD:

LIST ANY PHYSICAL DEFECTS

WERE YOU EVER INJURED? GIVE DETAILS

HAVE YOU ANY DEFECTS IN HEARING? IN VISION? IN SPEECH?

IN CASE OF EMERGENCY NOTIFY

NAME ADDRESS PHONE NO.

I AUTHORIZE INVESTIGATION OF ALL STATEMENTS CONTAINED IN THIS APPLICATION. I UNDERSTAND THAT MISREPRESENTATION OR OMISSION OF FACTS CALLED FOR IS CAUSE FOR DISMISSAL. FURTHER, I UNDERSTAND AND AGREE THAT MY EMPLOYMENT IS FOR NO DEFINITE PERIOD AND MAY, REGARDLESS OF THE DATE OF PAYMENT OF MY WAGES AND SALARY BE TERMINATED AT ANY TIME WITHOUT ANY PREVIOUS NOTICE.

DATE SIGNATURE

DO NOT WRITE BELOW THIS LINE

TO BE COMPLETED DAY EMPLOYMENT BEGINS

DATE

HEIGHT WEIGHT AGE DATE OF BIRTH

SINGLE MARRIED WIDOWED CITIZEN U.S.A. SEX

THE ABOVE INFORMATION NEEDED FOR PENSION, HOSPITALIZATION INSURANCE, ETC., AND NOT FOR HIRING PURPOSES.

INTERVIEWED BY DATE REMARKS

NEATNESS		CHARACTER	
PERSONALITY		ABILITY	

HIRED FOR DEPT. POSITION WILL REPORT SALARY WAGES

APPROVED: 1. 2. 3.

EMPLOYMENT MANAGER DEPT. HEAD GENERAL MANAGER

JOB APPLICATIONS AND INTERVIEW
UNIT III

ASSIGNMENT SHEET #4--MAKE AN APPOINTMENT BY PHONE

Making an appointment by phone does two things. First, it shows that you are interested in saving the employer's time. Second, it shows that you are thoughtful for asking what would be the best time for you to see the employer.

Role play a situation where you make an appointment by phone using the guidelines listed below. After you have completed the role play, use the checklist on the following page to check your performance.

Follow these steps in making an appointment by phone:

1. Plan what you are going to say before you call.
2. State your name and reason for calling.

   Example: "Hello, this is Pat Simmons and I'm calling about your ad in last night's paper for a greensworker. May I have an appointment for an interview?")

3. Ask when would be the best time for you to come for an interview.
4. Record the day, time, and place of the interview.
5. Thank the receptionist for her/his help.

Remember these things when calling for an appointment:

1. The receptionist is there to help you. Keep him/her on your side.
2. Don't ask over the phone how much the job pays.
3. Be polite and courteous. Remember that this call is the first contact you may have had with the firm. Make that first impression a good one.

ASSIGNMENT SHEET #4

Checklist for Demonstration

1. Were prepared before calling YES NO
2. Did not have to stammer to find the right words YES NO
3. Identified yourself immediately YES NO
4. Stated reason for calling immediately YES NO
5. Asked when would be the best time for the employer to see you YES NO
6. Were courteous and friendly YES NO
7. Thanked the receptionist YES NO
8. Made record of the interview date, hour, and place YES NO

JOB APPLICATIONS AND INTERVIEW
UNIT III

ASSIGNMENT SHEET #5--PARTICIPATE IN A JOB INTERVIEW

Now that you are prepared for an interview, team up with another student in class. Assume the roles of interviewer and applicant and then switch so each of you gets to play both roles. Apply for the job you now have or for the one for which you wrote the letter of application. Let your other classmates evaluate your performance using the job interview evaluation form below. Role-play a job interview or use the sample interview included in this assignment sheet. Videotape the practice sessions if possible.

JOB INTERVIEW EVALUATION FORM

	YES	NO
Preparing for the Interview		
1. Were you clean, well-groomed, and neat?	_____	_____
2. Did you wear appropriate clothes and shoes for the type of job for which you are applying?	_____	_____
3. Did you take an ink pen and resume´ with the information you may need about social security number, references, addresses, dates employed, and dates attended school?	_____	_____
4. Did you go alone, not taking parents, children, or friends with you?	_____	_____
5. Were you on time for the interview?	_____	_____
6. Did you know the name and title of the interviewer?	_____	_____
7. Did you know pertinent facts about the firm such as the name, kind of business, products and services, reasons you want to work there, how long firm has been in operation?	_____	_____
8. When you met the receptionist did you smile, introduce yourself, state that you have an appointment, follow the receptionist's instructions, and wait patiently?	_____	_____

ASSIGNMENT SHEET #5

		YES	NO
Participating in the Interview			
9.	Did you enter with poise and greet the interviewer by name?	_____	_____
10.	Did you shake hands firmly if the interviewer offered his/her hand?	_____	_____
11.	Did you introduce yourself and state the purpose of the call?	_____	_____
12.	Did you seat yourself only at the interviewer's invitation?	_____	_____
13.	Did you show signs of nervousness?	_____	_____
	(NOTE: If you do not know where to put your hands, leave them on your lap and keep them still.)		
14.	Did you NOT place personal things on interviewer's desk, smoke, or chew gum?	_____	_____
15.	Did you look alert, interested, and enthusiastic?	_____	_____
	(NOTE: Sit slightly forward in the chair to give an alert appearance.)		
16.	Were you confident and courteous?	_____	_____
	(NOTE: Words such as *Mr., Miss, Mrs., Ms., please, thank you*, and *sir* never go out of style.)		
17.	Did you answer questions clearly and not interrupt?	_____	_____
Anticipating Questions and Volunteering Proper Information			
18.	Did you avoid just giving all yes and no answers?	_____	_____
19.	Did you avoid criticisms of former employees or competitors?	_____	_____

ASSIGNMENT SHEET #5

		YES	NO
20.	Did you avoid talking about personal problems? (NOTE: The interviewer must be interested more in what you can contribute to the business than what the business can do for you. Do not use a sob story about how desperate you are for a job.)	____	____
21.	Did you show copies of your work if applicable?	____	____
22.	Did you state that you are willing to start at the beginning salary?	____	____
23.	Did you find a true, positive statement concerning your reasons for leaving previous jobs, even if you were fired? Examples: "I was laid off, but I learned from my mistakes." "I left because they did not need as many employees during the slow season."	____	____
24.	Did you try to mention your best qualities in relation to something concrete? Example: "I earned 75 percent of my expenses while going to school" is better than "I am a hard worker and want to get ahead"	____	____
25.	Did you give the lead back to the interviewer, if you found yourself talking too long, by saying "Perhaps you have some other questions to ask me?"	____	____
26.	Were you prepared for personal questions about your home life and your parents' occupations?	____	____
27.	Did you avoid questions concerning politics or economics?	____	____

ASSIGNMENT SHEET #5

		YES	NO
28.	Did you answer questions about career objectives using specific terms about what you would like to do in the near future in that particular field without limiting your opportunities?	_____	_____
	Example: A position in sales or marketing that will eventually lead to a management position. No locational preference		
29.	Did you look directly at the interviewer, smile, use correct English, and speak in clear moderate tones?	_____	_____
	(NOTE: Avoid swearing or using slang terms.)		
30.	Did you show an interest in the company by asking questions?	_____	_____
31.	Did you really try to sell yourself?	_____	_____
	(NOTE: Never refer to yourself as just average or fair. Always look for a positive response.)		
32.	Did you give the interviewer the opportunity to mention salary and fringe benefits?	_____	_____
33.	Did you remind the interviewer of the conversation topic if he/she is interrupted by a telephone call?	_____	_____

Closing the Interview

34.	Did you watch for signs that the interview was over, such as the interviewer shuffling papers and moving around in the chair?	_____	_____
35.	Did you ask, "May I say one thing more?" or "Would you be interested in . . .?" if the interview seemed to be ending before all important selling points had been made?	_____	_____
36.	Did you thank the interviewer for her/his time and leave promptly?	_____	_____

ASSIGNMENT SHEET #5

YES NO

Following Up the Interview

37. Did you write a follow-up letter, call, or visit again to express interest in the job and appreciation for the opportunity to interview? ____ ____

(NOTE: EVEN IF THE INTERVIEWER DOES NOT OFFER THE POSITION, YOU SHOULD LEARN FROM EVERY SITUATION AND TRY TO IMPROVE YOUR INTERVIEWING TECHNIQUES.)

ASSIGNMENT SHEET #5

SAMPLE JOB INTERVIEW

(NOTE: Two students may rehearse this script and read it in front of the class to show how an interview might be conducted.)

A = Applicant

I = Interviewer

A (Enters room, pauses, smiles, and approaches Ms. Jones with his hand extended to shake hands.) Hello, Ms. Jones. I'm Joe Hunter and I am applying for the job which you advertised in Friday's *Daily Blunder*.

I Hello, Mr. Hunter. Won't you have a seat?

A Thank you. I have a resumé which may be helpful to you. (Hands Ms. Jones the resumé and sits down.)

I This is a very well-prepared data sheet. Well, Joe, tell me about yourself.

A I'm a senior at Podunk High School where I'm enrolled in vocational agriculture. I'm interested in working in a business like yours after graduation. My older sister works in a similar business in Big City, and I think there are a lot of future opportunities in this field.

I Joe, have you had any work experience or are you currently working anywhere?

A Yes. I am working as a veterinarian's helper at Podunk Animal Clinic. I am responsible for keeping the cage area clean and well-stocked with fresh food and water as well as exercising the animals. I have also done odd jobs for my relatives and neighbors.

I What do you think you have learned from your job at the animal clinic?

A Probably the most important thing I have learned is how to assume responsibilities and manage work time.

I What kind of person is your employer and how do you get along?

A My employer has several good qualities. He offers very good service to the customers, and we get along well.

I Why do you want to leave?

A I feel there would be more opportunity for me to develop the skills necessary to reach my occupational objective in a business such as yours.

ASSIGNMENT SHEET #5

I How did you get the job at the clinic?

A A friend of mine who used to work there recommended me as her replacement.

I When would you be able to start and what hours could you work?

A I could start work as soon as I give my present employer two weeks notice. I will be able to work from 2:30 to 5:30 on weekdays and all day on weekends and holidays.

I In which school activities are you involved this year?

A I am a member of the student council, glee club, and FFA. I should know about any trips with these groups early enough to make arrangements with you and another employee so there will be no problems with missing work.

I Do you have any financial obligations, such as a car payment?

A No, ma'am.

I Have you ever had any difficulty with the police other than a traffic violation?

A No, ma'am.

I How much do you expect to earn?

A I understand from some of the other employees that a person may begin at the minimum wage and advance with time and experience.

I That's right. Here is a brochure explaining our pay scale and other benefits.

A Thank you.

I Thank you for talking with us. We will let you know about the job soon.

A (Stands) Thank you for your time, Ms. Jones. Have a good day. (Shakes hands and leaves.)

JOB APPLICATIONS AND INTERVIEW
UNIT III

ASSIGNMENT SHEET #6--WRITE A FOLLOW-UP LETTER

1. Write a follow-up letter thanking the employer for the interview. Use any form you wish or follow the format of the sample follow-up letter on the next page.

2. Make sure your letter meets the following standards.

    a. Typed perfectly

    b. Clean, neat, and attractively arranged on the paper

    c. Free from spelling, punctuation, and grammatical errors

    d. Sent within a day or two after the interview

3. Include the following points in your follow-up letter.

    a. An expression of appreciation for interviewer's time and interest

    b. A summary of your qualifications and interest in the position

    c. Your name, address, and phone number (to make it easier for your employer to contact you)

4. Make this last bid for the job a prime example of your excellent work habits. Make the letter as clean, neat, and well-worded as you possibly can.

ASSIGNMENT SHEET #6

Sample Follow-up Letter

702 Arapaho
Stillwater, Oklahoma 74074
October 8, 1977

Mr. Joe Smith
Personnel Manager
Stillwater Country Club
1515 West 6th
Stillwater, Oklahoma 74074

Dear Mr. Smith:

Thank you for interviewing me for the greensworker position in your office. I feel that working for the Stillwater Country Club would be enjoyable and that I could do the maintenance and general lawn work which the position requires. I hope that I will have the opportunity to demonstrate my abilities.

The application form you gave me is enclosed.

I will be available for work October 10. You may call me at home after 3:30 p.m. The number is 377-2000.

Sincerely yours,

Pat Simmons

Pat Simmons

Enclosure

JOB APPLICATIONS AND INTERVIEW
UNIT III

TEST

NAME ______________________________ SCORE ______________

1. Match the terms on the right to the correct definitions.

_____a. Person who hires another for wages

_____b. Union-maintained office where members can find out about possible job openings

_____c. Classified advertisement placed by individual seeking employment and listing individual's qualifications

_____d. Capable of being read; clear

_____e. Meeting of employer and job applicant for purpose of evaluation and questioning

_____f. Business that is designed to help individuals find employment

_____g. Classified advertising that does not identify the advertiser

_____h. Program that provides on-the-job skill training with a skilled worker

_____i. Written statement or summary of information about an individual that would be of interest to a prospective employer; personal data sheet

_____j. Advertisement listing the kind of job available and the required qualifications

_____k. Printed form on which the job applicant records his/her personal history, job experience, education, and references

1. Interview
2. Resumé
3. Blind ad
4. Help-wanted ad
5. Employment/ situation wanted ad
6. Legible
7. Equal opportunity employer
8. Employer
9. Employee
10. Personnel management
11. Employment
12. Employment agency
13. Application form
14. Hiring hall
15. Apprenticeship

_____l. Employer who is making a special effort to assure that no form of discrimination is practiced

_____m. Person employed by another usually for wages or salary and in a position below the executive level

_____n. Activity in which one engages or is employed; work

_____o. Area of retailing related to the selection, training, placement, advancement, and welfare of all employees

2. Name three sources for locating employment opportunities.

a. ____

b. ____

c. ____

3. Match the types of employment agencies on the right to the correct descriptions.

_____a. Offers job information; offers career guidance through counselors and teachers

_____b. Charges a placement fee for service; collects fee when employment is secured; requests contract between you and the agency; is controlled by state law

_____c. Does not charge a placement fee for services; is supported by state or federal government funds

1. Private employment agency
2. Public employment agency
3. School placement office

4. Distinguish between services provided for employers (ER) and those provided for employees (EE) by public and private employment agencies. Place the correct letters in the blanks provided.

_____a. Finds jobs for workers; provides vocational counseling; arranges interviews; gives aptitude and ability/interest tests

_____b. Finds workers for jobs; arranges interviews; matches qualified applicants to job vacancies

5. Select from the list below guidelines for dressing for an interview by placing an "X" in the appropriate blanks.

______a. Sexy

______b. Salary range

______c. Kind of job

______d. Tight-fitting clothes

______e. Well-groomed

______f. Modest

______g. High-fashion items and fads

______h. Age of the interviewer

______i. Appearance of other workers

6. Name three job-training sources.

a. ____

b. ____

c. ____

7. Select from the list below items which an applicant may need to prepare when applying for a job.

______a. Follow-up letter

______b. Letter of resignation

______c. W4 form

______d. Personal data sheet (resumé)

______e. Letter of application

______f. Application form

8. Prepare a resumé.

9. Write a letter of application.

10. Complete a job application form.

11. Make an appointment by phone.

12. Participate in a job interview.

13. Write a follow-up letter.

(NOTE: If activities 8-13 have not been accomplished prior to the test, ask the instructor when they should be completed.)

JOB APPLICATIONS AND INTERVIEW
UNIT III

ANSWERS TO TEST

1. a. 8
   b. 14
   c. 5
   d. 6
   e. 1
   f. 12
   g. 3
   h. 15
   i. 2
   j. 4
   k. 13
   l. 7
   m. 9
   n. 11
   o. 10

2. Any three of the following:
   a. Other people
   b. Newspapers
   c. Former employers
   d. Window signs
   e. Employment agencies
   f. Unions
   g. Employment offices of private business firms
   h. School placement service
   i. Federal agencies

3. a. 3
   b. 1
   c. 2
4. a. EE
   b. ER
5. b, c, e, f, h, i
6. Any three of the following:
   a. On-the-job training
   b. High school equivalency certificate
   c. Extension courses
   d. Community and junior colleges
   e. Vocational schools
   f. Special schools
   g. Apprenticeship programs
7. a, d, e, f
8. Evaluated to satisfaction of instructor
9. Evaluated to satisfaction of instructor
10. Evaluated to satisfaction of instructor
11. Evaluated to satisfaction of instructor
12. Evaluated to satisfaction of instructor
13. Evaluated to satisfaction of instructor

CIVIC AND COMMUNITY RESPONSIBILITIES
UNIT IV

UNIT OBJECTIVE

After completion of this unit, the student should be able to apply leadership skills in the community and local government and evaluate student's potential for becoming a leader. This knowledge will be evidenced by completion of assignment sheets and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Define *leadership*.
2. Select from a list the reasons for becoming a good leader.
3. Select from a list the steps in becoming a good leader.
4. Match styles of leadership to correct descriptions.
5. Match roles found in groups to correct descriptions.
6. Match forms of city government to correct descriptions.
7. List categories of organizations where leadership skills may be used.
8. Select from a list activities in which a civic club can participate.
9. Select leaders within the community.

CIVIC AND COMMUNITY RESPONSIBILITIES
UNIT IV

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

  A. Provide student with objective sheet.

  B. Provide student with information and assignment sheets.

  C. Make transparencies.

  D. Discuss unit and specific objectives.

  E. Discuss information sheet.

  F. Have student select three individuals in the community that the student feels are leaders and list three leadership traits for each.

  G. Have students attend a city council meeting to determine the type of city government.

  H. Have student participate in a group skit.

    1. Setting: Seven chairs in semi-circle facing class or audience

    2. Characters (Students must stay strictly in designated roles):

      a. Ms./Mr. Opinion-Seeker--Asks a number of people for their ideas and thoughts

      b. Mr./Ms. Information-Giver--Shows evidence of research and thought of the question at hand through comments

      c. Ms./Mr. Blocker--Has no ideas, but is against everything

      d. Mr./Ms. Distractor--Displays lack of involvement in the group process; causes disturbances

      e. Ms./Mr. Summarizer--Pulls group's thoughts together into a course of action

      f. Mr./Ms. Follower--Agrees with everything that is said

      g. Mr./Ms. No-Show (Blank chair on stage)--Didn't care enough to show up for the meeting

        3. Scene: FFA meeting called to discuss a subject tabled at the last meeting

        4. Procedure:

            a. Explain that this is an FFA meeting to decide on (subject or order of day)

               (NOTE: Have audience watch carefully for roles of individuals. After the skit has ended, the instructor will describe a role and will then ask members of the audience to point out the person who played the role.)

            b. Allow time for skit participants to demonstrate their roles

            c. Save Mr./Ms. No-Show until last

            d. Relate to home FFA meetings

    I. Have student attend a civic club meeting and report back to class.

    J. Give test.

    K. Reteach if necessary.

II. Instructional materials:

    A. Objective sheet

    B. Information sheet

    C. Transparency masters

        1. TM 1--Leadership

        2. TM 2--Leadership Styles

        3. TM 3--Roles Found in Groups

        4. TM 4--Roles Found in Groups (Continued)

        5. TM 5--Roles Found in Groups (Continued)

        6. TM 6--Roles Found in Groups (Continued)

        7. TM 7--Roles Found in Groups (Continued)

    D. Assignment Sheet #1--Select Leaders Within Your Community

    E. Test

    F. Answers to test

III. Unit references:

A. Future Farmers of America. *Official FFA Manual.* Alexandria, Virginia: National FFA Supply Service, 1977.

(NOTE: The manual is available from the National FFA Supply Service; P. O. Box 15159; Alexandria, Virginia 22309.)

B. Clark, Nadine I.; Gruenewald, W. L.; Edmonson, James B.; Dondineau, Arthur. *Civics for America.* New York: The MacMillan Co., 1965.

CIVIC AND COMMUNITY RESPONSIBILITIES
UNIT IV

INFORMATION SHEET

I. Leadership--Combination of qualities which inspires confidence, draws others toward the leader, and causes them to follow (Transparency 1)

II. Reasons for becoming a good leader

  A. Develops leadership, which is needed in all fields

  B. Is a challenge to learn leadership skills

  C. Creates respect for others

  D. Helps individuals to mature

  E. Improves living conditions

III. Steps in becoming a good leader

(NOTE: Leaders are made, not born.)

  A. Study qualities of a good leader

  B. Evaluate your strong and weak points

  C. Become a good follower

  (NOTE: It is important to become a good follower before becoming a good leader.)

  D. Develop a plan for training yourself as a leader

IV. Styles of leadership (Transparency 2)

(NOTE: The most successful leader uses all three types of leadership, depending on the circumstances and the people involved. The person who uses only one style will have trouble due to the individual differences of the people in the work group. Certain personalities seem to require different types of leadership.)

  A. Autocratic

  (NOTE: This style is used best with aggressive, hostile, or insecure persons or in a binding situation.)

    1. Does all the planning, organizing, controlling, and coordinating

    2. Gives more emphasis to getting the job done than to the feelings of others

INFORMATION SHEET

3. Is characterized by close supervision

B. Democratic

(NOTE: This style is used best with aggressive, cooperative persons. It works well with established employees and methods.)

1. Shows consideration for others

2. Listens to and uses good ideas from others

3. Is characterized by general supervision

4. Defines goals and lets co-workers use their judgment about how to do the job to some extent

5. Checks with the co-workers periodically to reward and/or make necessary corrections

C. Free rein

(NOTE: This style is used best with aggressive, cooperative, individualistic persons.)

1. Passes on information and direction from higher authority

2. Depends entirely on others to get the job done

V. Roles found in groups

A. Initiator/contributor: Suggests or proposes new ideas or changes to the group (Transparency 3)

B. Opinion-seeker: Asks not for the facts primarily but for a clarification of the values involved in a suggestion made or in alternative suggestions (Transparency 3)

C. Opinion-giver: States own beliefs and emphasizes own views (Transparency 3)

D. Information seeker: Asks for information and facts pertinent to the problem being discussed (Transparency 3)

E. Information giver: Offers facts or generalizations to the group which are relative to his/her own experiences (Transparency 4)

F. Elaborator: Spells out suggestions in terms of examples (Transparency 4)

(NOTE: The elaborator offers a rationale for suggestions and tries to deduce how any idea or suggestion might work out if adopted by the group.)

INFORMATION SHEET

G. Summarizer--Pulls ideas together so group might see where they are in their deliberation (Transparency 4)

H. Integrator-Tries to extract key points from several ideas and show what they have in common (Transparency 5)

I. Recorder--Writes down the suggestions and group decisions (Transparency 5)

J. Encourager--Praises, agrees with, and accepts the contributions of others (Transparency 5)

(NOTE: The encourager is able to draw out other people and make them feel that their ideas are important and worth hearing.)

K. Compromiser--Yields own position and admits her/his error or offers to meet halfway (Transparency 6)

L. Follower--Goes along with the movement of the group (Transparency 6)

(NOTE: The follower may be an excellent worker but more or less passively accepts the ideas of others, serving as an audience in group discussion and decision-making.)

M. Dominator--Tries to assert authority or superiority in manipulating the group or certain members (Transparency 6)

N. Blocker--Tends to be negative to all ideas, rejecting without reason (Transparency 6)

O. No-show--Doesn't care enough to show up for meeting (Transparency 7)

P. Recognition-seeker--Seeks in whatever way possible to call attention to himself/herself or to own activities and accomplishments (Transparency 7)

Q. Distractor--Displays lack of involvement in the group processes (Transparency 7)

(NOTE: Activity may take the form of horseplay, cynicism, fooling around with gadgets, and other forms of distracting behavior.)

VI. Forms of city government

A. Weak mayor, strong council plan

1. Mayor cannot veto city ordinances just because she/he disapproves of them

2. Mayor does not approve city budget

INFORMATION SHEET

   3. Department heads are not directly responsible to the mayor
   4. Council has control over the mayor and department heads

B. Strong mayor, weak council plan

   1. Mayor may veto city ordinances
   2. Mayor plans city budget
   3. Mayor may appoint and remove department heads
   4. Council is lawmaking body only

C. Commission plan

   1. Voters elect commission (council)
   2. Commissioners appoint chairperson (mayor)
   3. Commissioners appoint other officials and heads of major city departments
   4. Commissioners pass city ordinances

D. Council manager plan

   1. Council passes city ordinances
   2. Council hires a trained city manager to be responsible for the work of city government

VII. Categories of organizations where leadership skills may be used

(NOTE: The purposes and activities of many organizations overlap into several areas. The differences often exist only in membership requirements and in the origin of the organization. A large number of the organizations also include social activities in their program of work.)

A. Work

Examples: Supervisor, co worker, union member

B. School

Examples: FFA, VICA, DECA, FBLA, FHA HERO, student council

C. Church

Examples: Youth group, boards, committees

INFORMATION SHEET

D. Civic/service clubs

Examples: Kiwanis, Lions, Rotary, Exchange; Jaycees, Masons, Knights of Columbus, Shriners, Odd Fellows, Demolay, Rainbows, Eastern Star, Elks Lodge, Moose Lodge

E. Economic organizations

Examples: Chamber of Commerce, cooperatives, Cattlemen's Association

F. Professional organizations

Examples: Business and Professional Women, National Vocational Agriculture Teachers' Association

G. Charitable organizations

Examples: United Fund, Red Cross

H. Advisory committees

Examples: Vocational program advisory committee, advisory committee for building a new lake near the city

I. Special interest groups

Examples: Veterans of Foreign Wars, American Legion, livestock breed associations, county fair board, Fraternal Order of Police, ecology groups, Alcoholics Anonymous

J. Political organizations

Examples: Republicans, Democrats

K. Support groups

Examples: Parent-Teacher Association, band boosters, FFA alumni groups

L. Age-oriented groups

Examples: Scouts, senior citizens groups

M. Athletic groups

Examples: Riding clubs, ski clubs, Little League

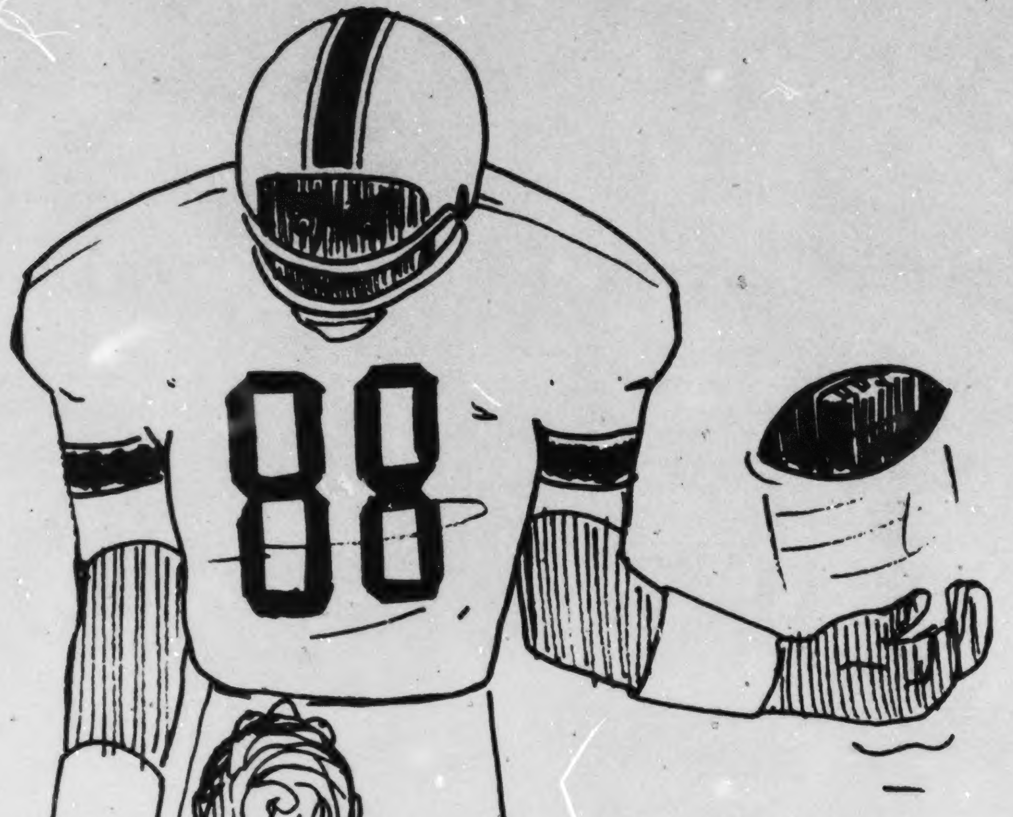
INFORMATION SHEET

VIII. Activities of civic clubs

- A. Sponsor 4-H and FFA livestock shows
- B. Raise money
- C. Assist with charitable organizations
- D. Assist with community improvement activities
- E. Provide leaders for groups

  Examples: FFA, 4-H, Senior Citizens

Leadership



"Leadership is the ability to get a person to do what you want him to do, when you want it done, in a way you want it done, because he wants to do it."

Eisenhower

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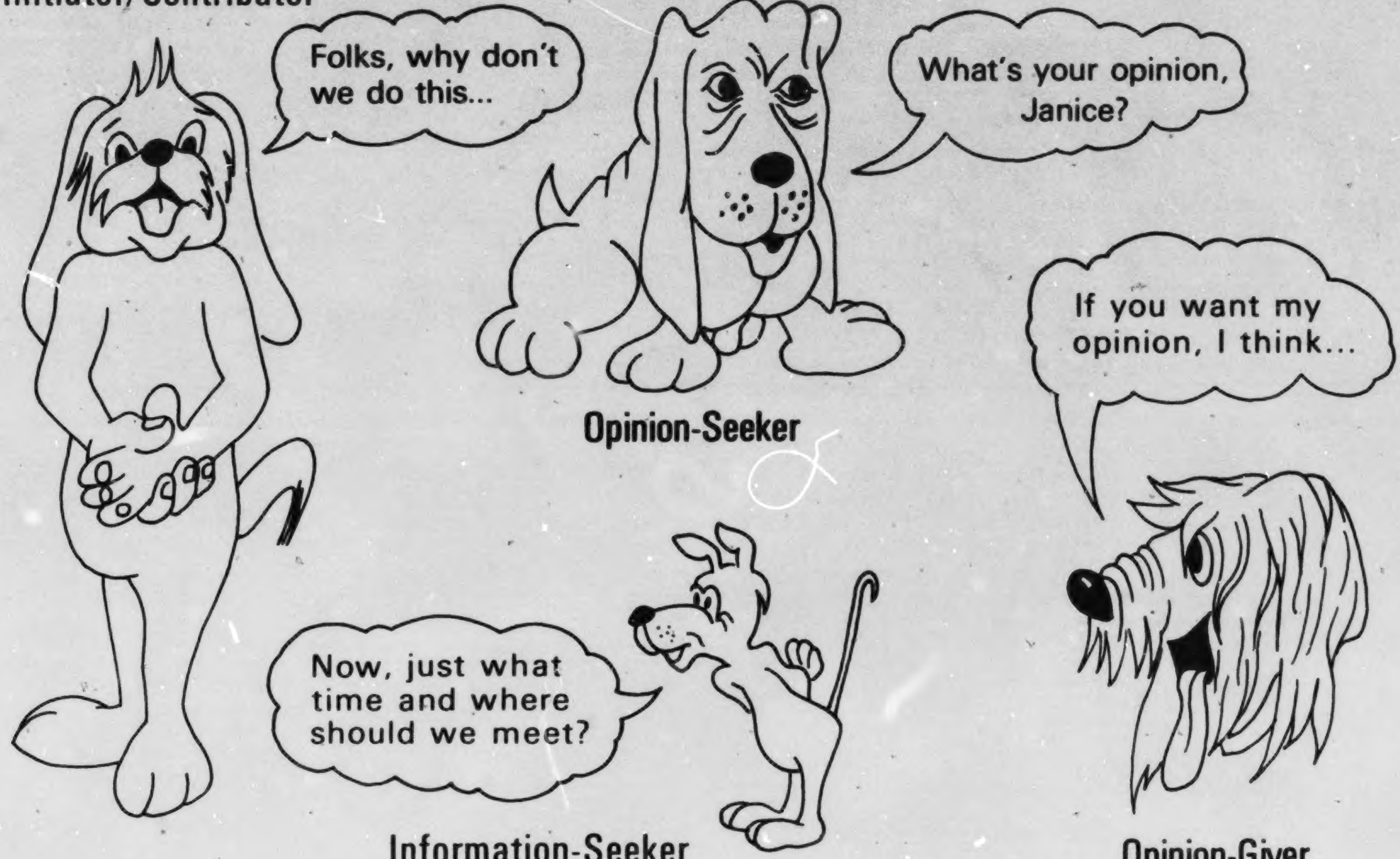
Leadership Styles

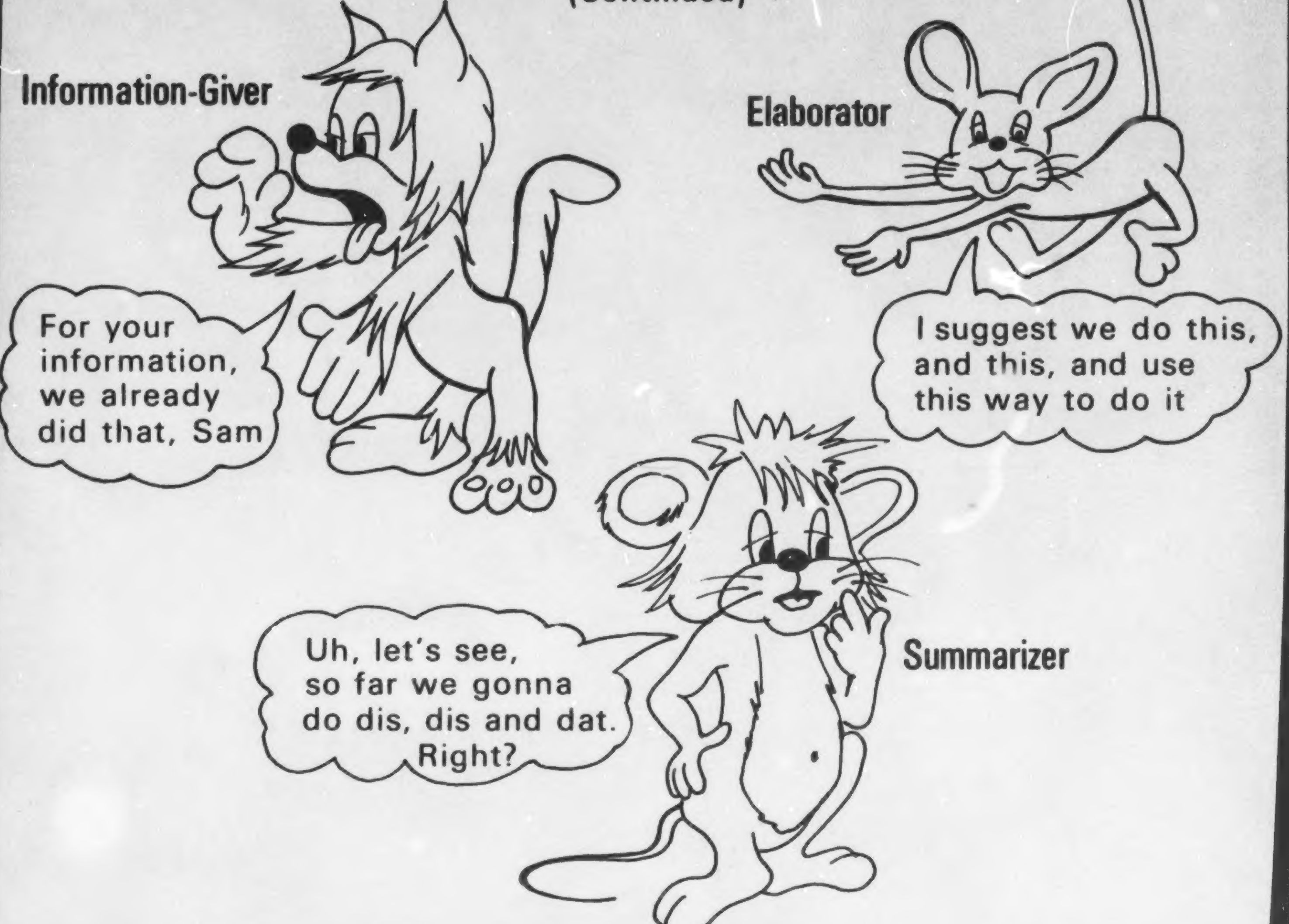
autocratic
democratic
free-rein

Roles Found In Groups


Initiator/Contributor
Folks, why don't we do this...
What's your opinion, Janice?
Opinion-Seeker
If you want my opinion, I think...
Now, just what time and where should we meet?
Information-Seeker
Opinion-Giver

Roles Found In Groups

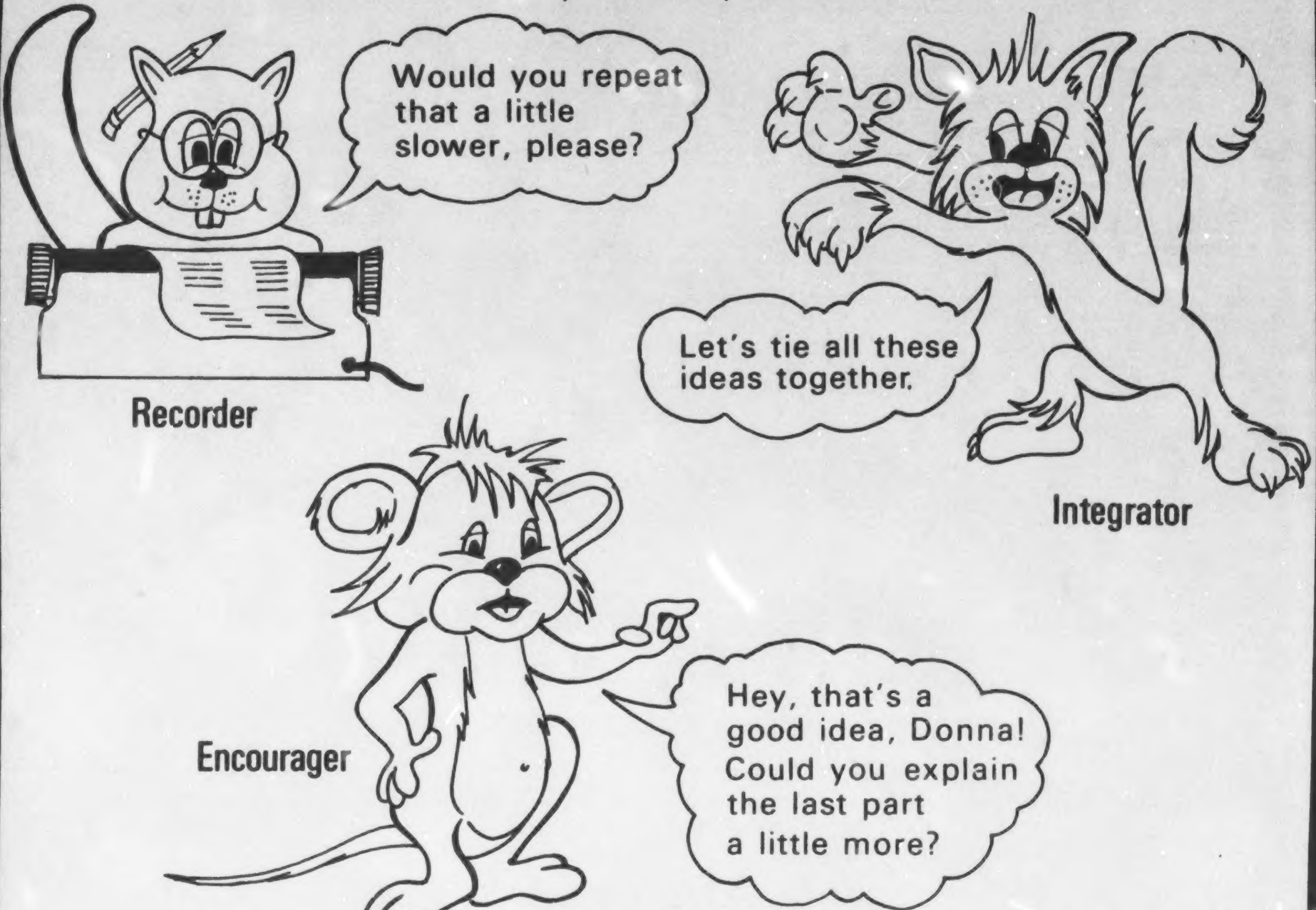
(Continued)



Information-Giver
For your information, we already did that, Sam
Elaborator
I suggest we do this, and this, and use this way to do it
Summarizer
Uh, let's see, so far we gonna do dis, dis and dat. Right?

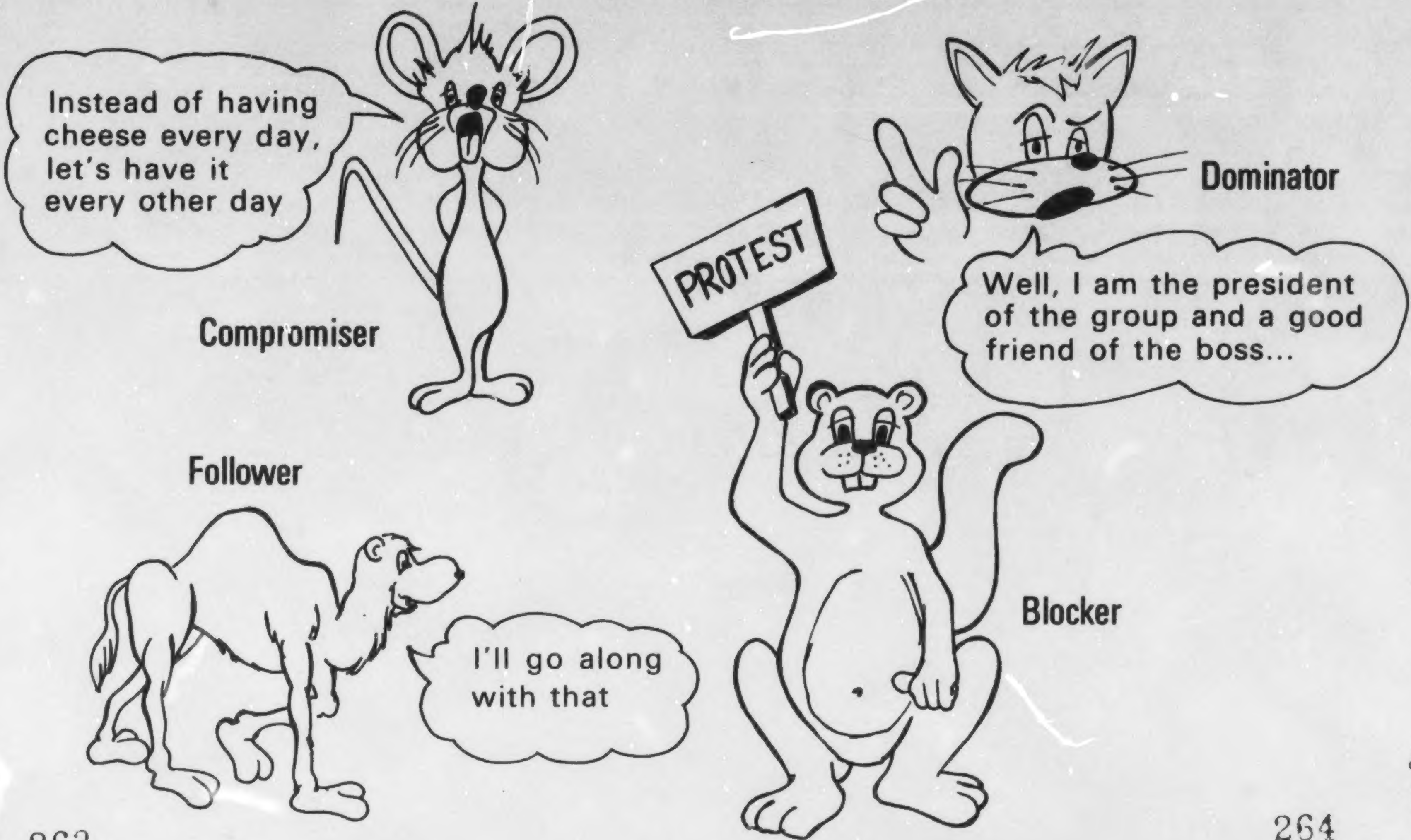
Roles Found In Groups

(Continued)


Would you repeat that a little slower, please?
Recorder
Let's tie all these ideas together.
Integrator
Encourager
Hey, that's a good idea, Donna! Could you explain the last part a little more?

Roles Found In Groups

(Continued)


Instead of having cheese every day, let's have it every other day
PROTEST
Well, I am the president of the group and a good friend of the boss...
I'll go along with that

Compromiser

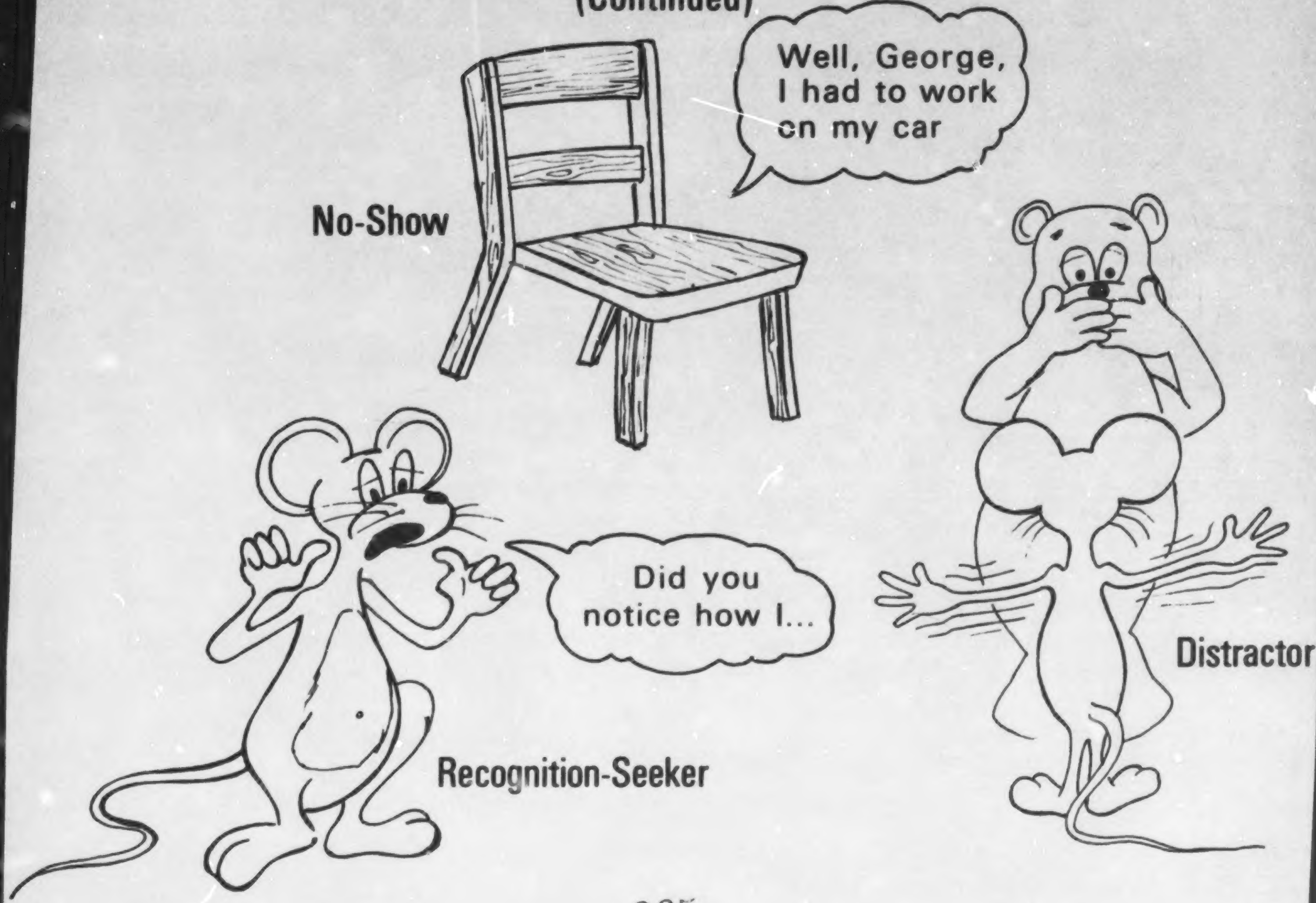
Dominator

Follower

Blocker

Roles Found In Groups

(Continued)


Well, George, I had to work on my car
No-Show
Did you notice how I...
Recognition-Seeker
Distractor

CIVIC AND COMMUNITY RESPONSIBILITIES
UNIT IV

ASSIGMENT SHEET #1--SELECT LEADERS WITHIN YOUR COMMUNITY

1. Select three individuals in your local community who appear to you to be good leaders. List three leadership traits that you believe each individual possesses.

NAME	LEADERSHIP TRAITS
a. ____________________	1) ____________________
	2) ____________________
	3) ____________________
b. ____________________	1) ____________________
	2) ____________________
	3) ____________________
c. ____________________	1) ____________________
	2) ____________________
	3) ____________________

2. Determine what type of city government you have in your community.

____

____

3. Who are the leaders in city government?

____

____

____

____

4. Name four civic or community clubs in your community.

a. ____

b. ____

c. ____

d. ____

CIVIC AND COMMUNITY RESPONSIBILITIES
UNIT IV

TEST

NAME ______________________________ SCORE ______________

1. Define *leadership*.

____

____

____

2. Select from the following list reasons for becoming a good leader. Place an "X" in the blanks.

______a. Creates respect for yourself

______b. Develops leadership, which is needed in all fields

______c. Helps individuals to become immature

______d. Is a challenge to learn leadership skills

______e. Creates poor living conditions

3. Select from the following list steps in becoming a good leader.

______a. Become a good follower

______b. Practice faults of a good leader

______c. Develop a plan for training others as followers

______d. Evaluate your strong and weak points

4. Match the styles of leadership on the right to the correct descriptions by placing the appropriate numbers in the blanks provided.

______a. Passes on information and direction from higher authority; depends entirely on others to get the job done

______b. Shows consideration for others; listens to and uses good ideas from others; is characterized by general supervision; defines goals and lets co-workers use their judgment about how to do the job to some extent; checks with co-workers periodically to reward them and/or make necessary corrections

1. Autocratic
2. Democratic
3. Free rein

______c. Does all the planning, organizing, controlling, and coordinating; gives more emphasis to getting the job done than to the feelings of others; is characterized by close supervision

5. Match roles found in groups on the right to the correct descriptions by placing the appropriate numbers in the spaces provided.

______a. Goes along with the movement of the group

______b. Displays lack of involvement in the group processes

______c. Writes down the suggestions and group decisions

______d. Tries to assert authority or superiority in manipulating the group or certain members

______e. Yields own position and admits her/his error or offers to meet halfway

______f. Tries to extract key points from several ideas and show what they have in common

______g. Seeks in whatever way possible to call attention to himself/herself or to own activities and accomplishments

______h. Asks for information and facts pertinent to the problem being discussed

______i. Tends to be negative to all ideas, rejecting without reason

______j. Pulls ideas together so group might see where they are in their deliberation

______k. States own beliefs and emphasizes own views

______l. Doesn't care enough to show up for meeting

______m. Suggests or proposes new ideas or changes to the group

______n. Spells out suggestions in terms of examples

1. Initiator/contributor
2. Opinion-seeker
3. Opinion-giver
4. Information-seeker
5. Information-giver
6. Elaborator
7. Summarizer
8. Integrator
9. Recorder
10. Encourager
11. Compromiser
12. Follower
13. Dominator
14. Blocker
15. No-show
16. Recognition-seeker
17. Distractor

______o. Praises, agrees with, and accepts the contributions of others

______p. Offers facts or generalizations to the group which are relative to his/her own experiences

______q. Asks not for the facts primarily but for a clarification of the values involved in a suggestion made or in alternative suggestions

6. Match forms of city government on the right to the correct descriptions.

______a. Voters elect commission (council); commissioners appoint chairperson (mayor); commissioners appoint other officials and heads of major city departments; commissioners pass city ordinances

______b. Mayor may veto city ordinances; mayor plans city budget; mayor may appoint and remove department heads; council is lawmaking body only

______c. Mayor cannot veto city ordinances just because she/he disapproves of them; mayor does not approve city budget; department heads are not directly responsible to the mayor; council has control over the mayor and department heads

______d. Council passes city ordinances; council hires a trained city manager to be responsible for the work of city government

1. Weak mayor, strong council plan
2. Strong mayor, weak council plan
3. Commission plan
4. Council-manager plan

7. List five categories of organizations where leadership skills may be used.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

8. Select from the list below activities in which a civic club may participate by placing an "X" in the spaces provided.

   _____a. Sponsor 4-H and FFA livestock shows

   _____b. Raise money to send club members on vacations

   _____c. Assist with charitable organizations

   _____d. Assist with community improvement activities

   _____e. Provide leaders for groups

9. Select leaders within your community.

   (NOTE: If this activity has not been accomplished prior to the test, ask the instructor when it should be completed.)

CIVIC AND COMMUNITY RESPONSIBILITIES
UNIT IV

ANSWERS TO TEST

1. Combination of qualities which inspires confidence, draws others toward the leader, and causes them to follow
2. b, d
3. a, d
4. a. 3
   b. 2
   c. 1
5. a. 12
   b. 17
   c. 9
   d. 13
   e. 11
   f. 8
   g. 16
   h. 4
   i. 14
   j. 7
   k. 3
   l. 15
   m. 1
   n. 6
   o. 10
   p. 5
   q. 2

6. a. 3
   b. 2
   c. 1
   d. 4
7. Any five of the following:
   a. Work
   b. School
   c. Church
   d. Civic/service clubs
   e. Economic organizations
   f. Professional organizations
   g. Charitable organizations
   h. Advisory committees
   i. Special interest groups
   j. Political organizations
   k. Support groups
   l. Age-oriented groups
   m. Athletic groups
8. a, c, d, e
9. Evaluated to satisfaction of instructor

[redacted]

Section C
Animal Science

SELECTING AND BREEDING LIVESTOCK
UNIT I

UNIT OBJECTIVE

After completion of this unit, the student should be able to select livestock using the results of performance and progeny testing and according to their genetic makeup. The student should be able to identify the different systems of breeding livestock and select the method that would most nearly fit into the student's particular farming operation. This knowledge will be evidenced by completion of assignment sheets and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with selecting and breeding livestock to the correct definitions.
2. Select from a list hereditary characteristics that are determined by genes.
3. Match the types of livestock to the correct number of chromosome pairs.
4. Discuss in a short paragraph how the genetic makeup of an animal is determined.
5. Distinguish between dominant and recessive genes.
6. Distinguish between simple gene inheritance and multiple gene inheritance.
7. Name the color inheritance of the offspring when given the mating combinations.
8. Discuss in a short paragraph how the sex of the offspring is determined.
9. Define *dwarfism* as it relates to livestock breeding.
10. Distinguish between performance testing and progeny testing.
11. Match the different systems of breeding livestock to the correct definitions.
12. Draw a diagram showing the inheritance of horns in cattle for the F_1 and F_2 generations.
13. Estimate all possible gene combinations when given the matings and using the checkerboard procedure.

SELECTING AND BREEDING LIVESTOCK
UNIT I

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

   A. Provide student with objective sheet.

   B. Provide student with information and assignment sheets.

   C. Make transparencies.

   D. Discuss unit and specific objectives.

   E. Discuss information and assignment sheets.

   F. Arrange a field trip to allow student an opportunity to see the different livestock breeding programs.

      Examples: Litton Charolais Ranch, OSU Bull Test Center, state fairs

   G. Obtain sale catalog from production sales for student to study pedigrees.

   H. Take pictures of different hereditary characteristics which may result from selective breeding.

   I. Have student work assignment sheets.

   J. Give test.

   K. Reteach if necessary.

II. Instructional materials:

   A. Objective sheet

   B. Information sheet

   C. Transparency masters

      1. TM 1--Hereditary Characteristics

      2. TM 2--Sex Determination

   D. Assignment sheets

      1. Assignment Sheet #1--Draw a Diagram Showing the Inheritance of Horns in Cattle for the F_1 and F_2 Generations

      2. Assignment Sheet #2--Estimate Possible Gene Combinations Using the Checkerboard Procedure

E. Answers to assignment sheets

F. Test

G. Answers to test

III. Unit references:

A. Ensminger, M. Eugene. *Animal Science.* Danville, Illinois: The Interstate Printers and Publishers, Inc., 1962.

B. Ensminger, M. Eugene. *Stockman's Handbook.* Danville, Illinois: The Interstate Printers and Publishers, Inc., 1962.

C. Ensminger, M. Eugene. *Beef Cattle Science.* Danville, Illinois: The Interstate Printers and Publishers, Inc., 1968.

SELECTING AND BREEDING LIVESTOCK
UNIT I

INFORMATION SHEET

I. Terms and definitions

A. Gene--Complex protein molecule that determines hereditary characteristics of living animals; located at definite points on the chromosomes

B. Chromosome--Thread-like structure which exists in pairs and carries genes

C. Mutation--Changes that take place in a gene

D. Mitosis--Division of the body cells

E. Meiosis--Division of the sex cells

F. Genetics--Branch of biology that deals with the heredity and variation of organisms

G. Gamete--Mature germ cell

H. Fertilization--Union of two unlike gametes

I. Zygote--Result of fertilization

J. Homozygous--Animal that is pure for a certain characteristic, such as the polled characteristic

K. Heterozygous--Animal that is a carrier of one dominant and one recessive factor

L. Phenotype--Classification determined by senses

Examples: Tall or dwarf, polled or horned

M. Genotype--Classification from the genetic formula

Examples: Dd, Tt, tt

N. Lethal gene--Genetic factor that causes death of the young, either during prenatal life or at birth

O. F_1--Symbol which represents the first cross from a mating

P. F_2--Symbol which represents second cross from a mating

INFORMATION SHEET

II. Some hereditary characteristics determined by genes (Transparency 1)

- A. Body size
- B. Color of hair coat
- C. Eye color
- D. Length of leg
- E. Ability to fatten

III. Chromosome pairs of different species

- A. Cattle 30 pairs
- B. Swine 40 pairs
- C. Sheep 27 pairs
- D. Chickens 6 pairs
- E. Humans 23 pairs
- F. Horses 30 pairs

(NOTE: With all possible combinations in chromosome pairs and genes, the livestock species can transmit over one billion different samples of inheritance. Therefore, no two animals within a given breed are exactly alike except identical twins.)

IV. Genetic makeup--Determined by the union of two cells, one from each parent

(NOTE: These two germ cells indicate whether a calf will be polled instead of horned, black instead of white, a bull instead of a heifer.)

V. Genes

A. Dominant--Genes that have the ability to cover up or mask the presence of one number of a set in the F_1 generation

Examples: Pure polled, red color in Shorthorns; white face in Herefords, drop ears in swine

(NOTE: Dominance is usually designated by a capital letter.)

B. Recessive--Genes that are covered up or masked in the F_1 generation

Example: Horned, erect ears in swine

(NOTE: Recessive genes are usually designated by a small letter.)

INFORMATION SHEET

VI. Gene inheritance

A. Simple--One pair of genes involved

B. Multiple--Several pairs of genes involved

Examples: Genes affecting meat production, milk and butterfat production, and growth rate

(NOTE: Growth rate is hard to identify and is controlled by several genes.)

VII. Color inheritance

A. Swine

1. Black breed (Poland China) x white breed (Chester White, Yorkshire, or Landrace)--Offspring will be white with black spots

2. Black breed (Poland China) x red breed (Duroc)--Offspring will be black and red spotted

3. Red breed x white breed--Offspring will be white with black spots on skin

4. Belted breed x red or black breed--Offspring will usually be belted, with some being solid black

B. Cattle

1. Purebred Angus (black) x purebred Hereford--Offspring will be black with white face

2. Brahman (steel gray) x Shorthorn (red)--Offspring will be red

3. Charolais x purebred Hereford--Offspring will be cream-colored, usually with a white face

4. Charolais x Angus--Offspring will usually be a cream to a smoky color

VIII. Sex determinants (Transparency 2)

A. Eggs of female contain like chromosomes known as *X* chromosomes

B. Sperm of male contain unlike chromosomes known as *X* and *Y* chromosomes

INFORMATION SHEET

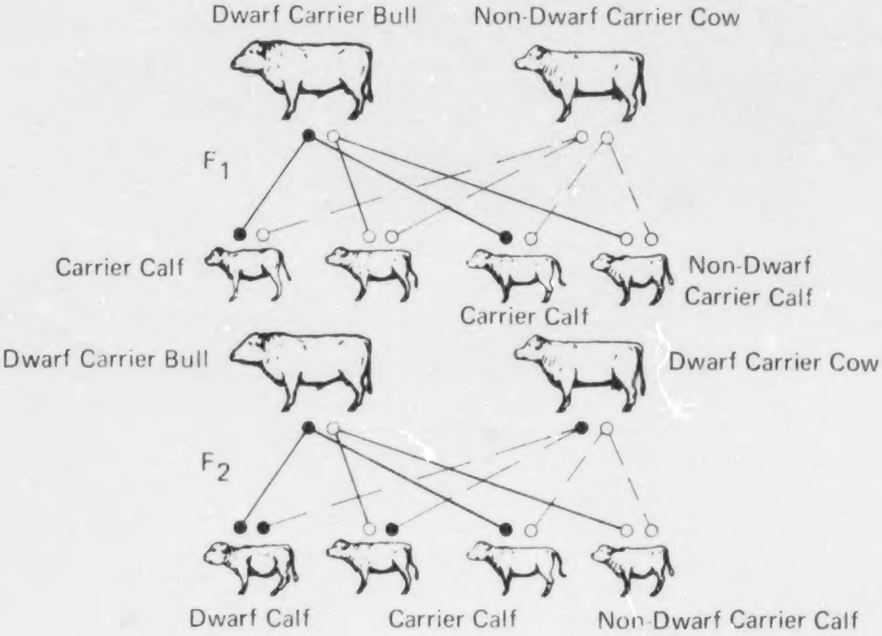
C. Egg and sperm unite randomly

   1. If egg and sperm contain like chromosomes (X and X), a female is conceived

   2. If egg and sperm contain unlike chromosomes (X and Y), a male is conceived

IX. Dwarfism--Inherited characteristic of cattle caused by a genetic origin but not carried by the sex chromosomes

(NOTE: It applies to any given calf having one carrier parent or both carrier parents.)



INFORMATION SHEET

X. Production testing

(NOTE: Production testing is the practice of evaluating and selecting animals on the basis of progeny and performance testing.)

A. Performance testing--Practice of evaluating and selecting animals on the basis of their individual merit or performance

(NOTE: This test applies to the measurement of an animal's ability to grow, convert feed to gain, produce and wean a calf, or yield a high-quality carcass. In order for this test to be of value, the animal should be compared to the performance of other animals of the same age being fed and handled under similar conditions.)

B. Progeny testing--Practice of selecting animals on the basis of the merit of their progeny (offspring)

(NOTE: In order for this type of test to be of value, several animals should be evaluated.)

XI. Systems of breeding

A. Purebred--Member of a breed; animals which possess a common ancestry and distinctive characteristics and are either registered or eligible for registry in the herd book of that breed

B. Inbreeding--System of breeding in which closely related animals are mated

Examples: Brother x sister, sire x daughter, son x dam

(NOTE: Scientists divide inbreeding into various categories according to the closeness of the relationship of the animals mated and the purpose of the mating.)

C. Outcrossing--Mating of animals that are members of the same breed but which show no relationship close up in the pedigree

D. Grading up--System of breeding in which purebred sires of a given pure breed are mated to native or grade females

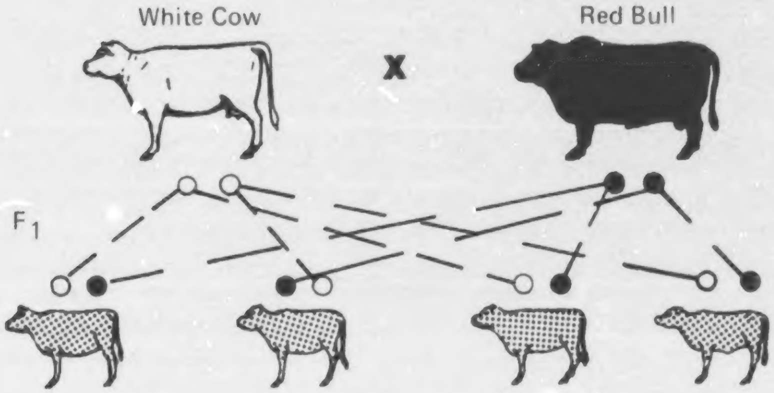
E. Crossbreeding--Mating of animals of different breeds

Examples: Hereford x Angus, Simmentol x Angus, Hampshire x Suffolk, Duroc x Chester White

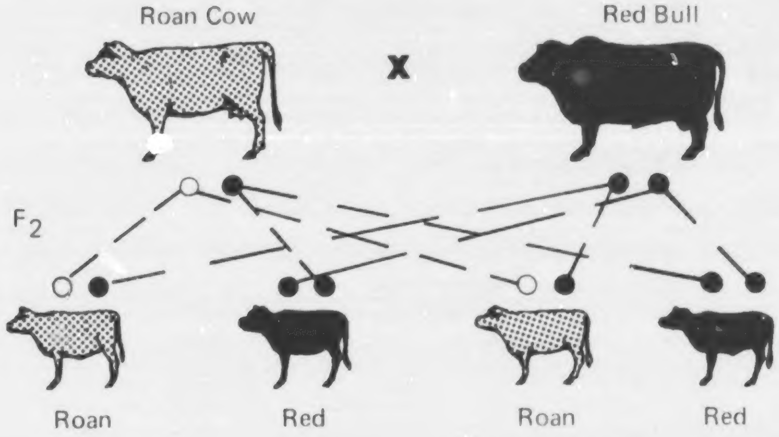
INFORMATION SHEET

XII. Diagrams showing inheritancy

A. Inheritance of color

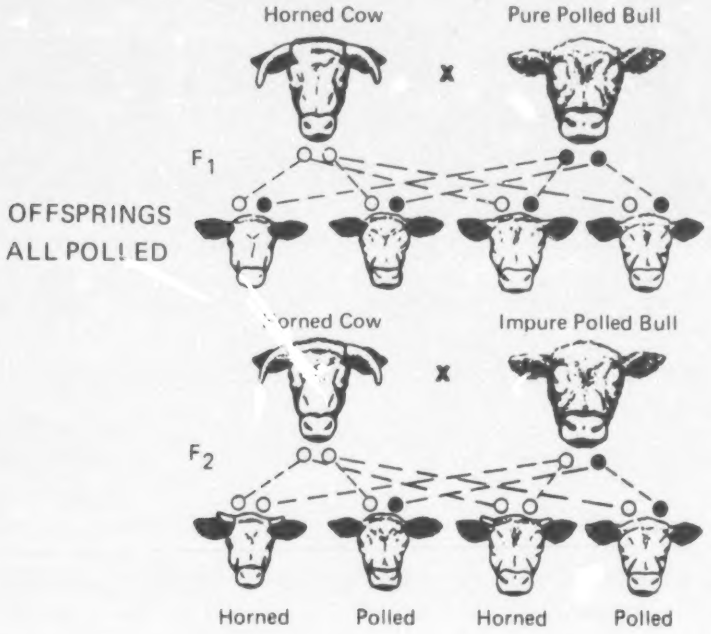


OFFSPRINGS ALL ROAN



INFORMATION SHEET

B. Inheritance of horns



XIII. Checkerboard system showing gene combinations

A. Dominant male (polled) x recessive horned female

Male genes

	P	P
p	Pp	Pp
p	Pp	Pp

F_1 Genotypic ratio 0:4:0
F_2 Phenotypic all polled

B. Modified two-pair ratios, F_1 and F_2

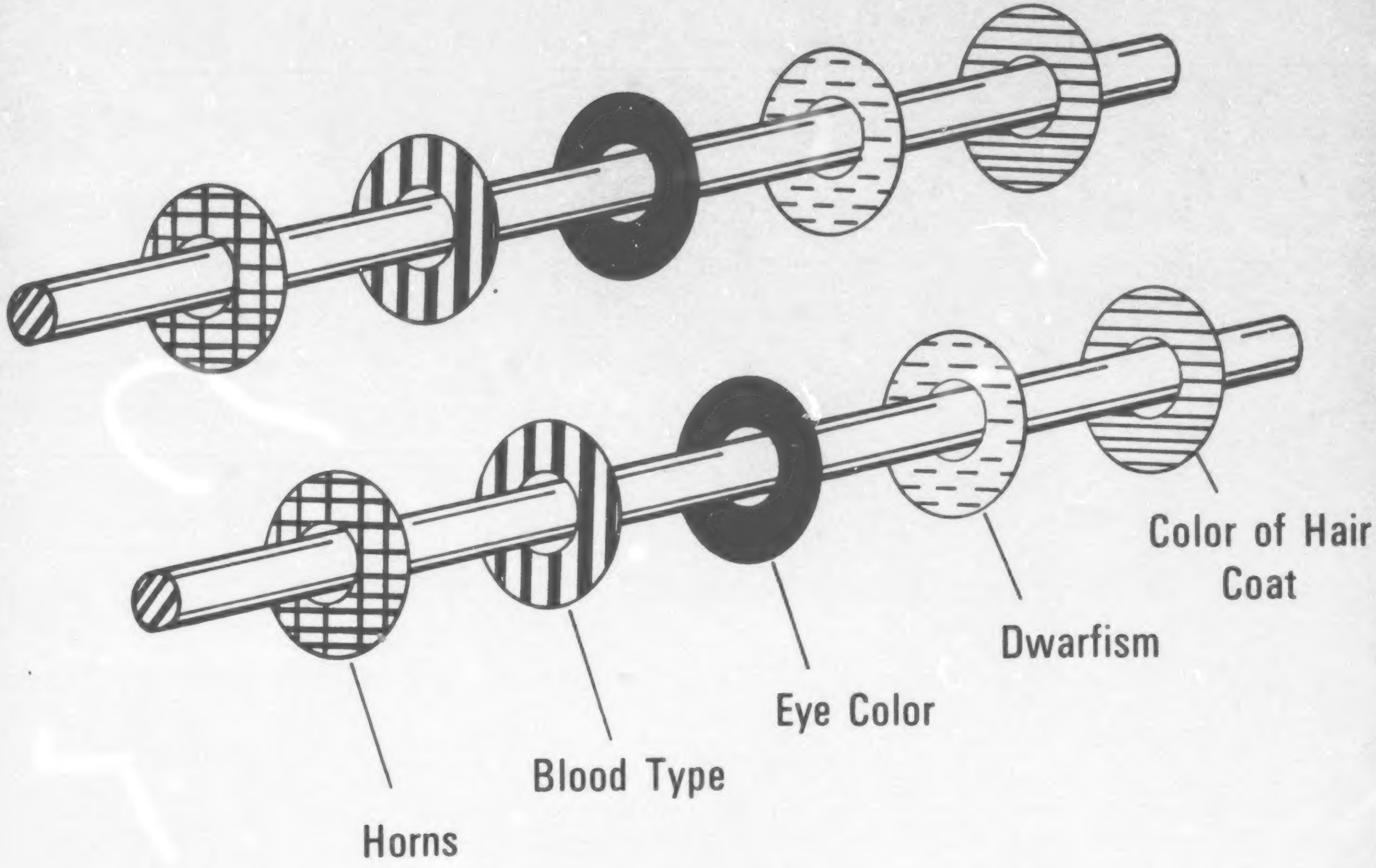
Parents	PBPB (Polled Black)	x	pwpw (Horned White)

F_1 PBpw

PBpw x PBpw

Gametes	Male	PB, Pw, pB, pw
	Female	PB, Pw, pB, pw

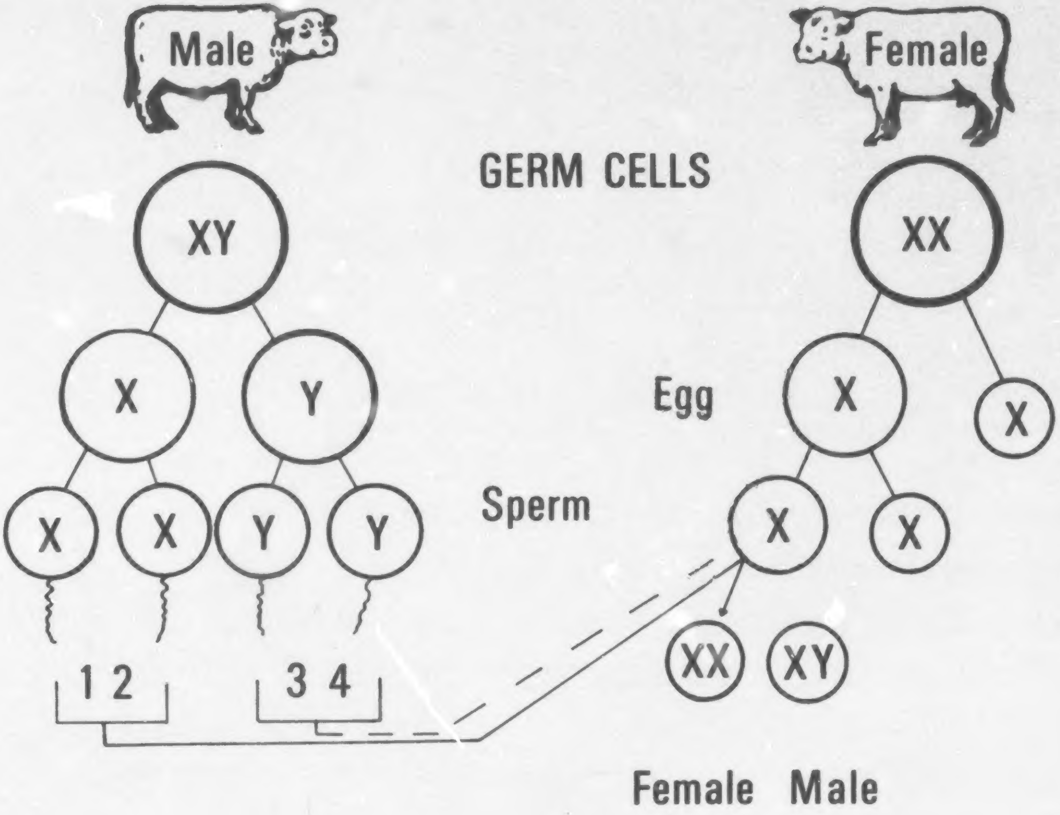
Hereditary Characteristics



Sex Determination

XY = MALE CHROMOSOME

XX = FEMALE CHROMOSOME



SELECTING AND BREEDING LIVESTOCK
UNIT I

ASSIGNMENT SHEET #1--DRAW A DIAGRAM SHOWING THE INHERITANCE OF HORNS IN CATTLE FOR THE F_1 AND F_2 GENERATIONS

Suppose you mated a pure polled bull having dominant genes (PP) to a horned cow having recessive genes (pp). What would be the offspring's gene combinations? Show these combinations by diagrammatic illustration for the F_1 and F_2 generations.

SELECTING AND BREEDING LIVESTOCK
UNIT I

ASSIGNMENT SHEET #2--ESTIMATE POSSIBLE GENE COMBINATIONS USING THE CHECKERBOARD PROCEDURE

Calculate each possible gene combination from the following matings. When completed, turn in to instructor for evaluation.

1. In Angus cattle, black hair color (B) is dominant over red hair color (b). What will be the gene combinations of the offspring from the following matings?

   a. BB male x BB female

   What will the F_1 genotypic ratio be? __________

   What will the F_2 phenotypic ratio be? __________

   b. Bb male x bb female

   What will the F_1 genotypic ratio be? __________

   What will the F_2 phenotypic ratio be? __________

   c. Bb male x BB female

   What will the F_1 genotypic ratio be? __________

   What will the F_2 phenotypic ratio be? __________

   d. b[illegible]ale x bb female

   What will the F_1 genotypic ratio be? __________

   What will the F_2 phenotypic ratio be? __________

ASSIGNMENT SHEET #2

2. Suppose you mated a polled cow (P) to a horned bull (p). What will be the offspring's gene combinations?

What will the F_1 genotypic ratio be? ___________

What will the F_2 phenotypic ratio be? ___________

3. Suppose you mated a polled cow with a recessive gene for horns (Pp) to a horned bull (pp). What would be the gene combination of the offspring?

What will the F_1 genotypic ratio be? ___________

What will the F_2 phenotypic ratio be? ___________

4. Suppose you mated a polled bull carrying a recessive gene for horns (Pp) to a like cow. What would be the gene combination of the offspring?

What will the F_1 genotypic ratio be? ___________

What will the F_2 phenotypic ratio be? ___________

5. a. Suppose you made a cross of a bull carrying tall genes (DD) to a cow carrying dwarf genes (dd). What would be the F_1 gene combination of the offspring? ____________

   b. Using a bull from the cross above carrying genes for tall with a recessive gene for dwarf (Dd) to a female with like genes, what would be the F_2 gene combination of the offspring?

ASSIGNMENT SHEET #2

How many animals would be pure for tall? __________

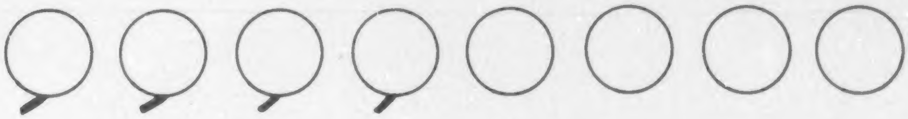
How many animals would be tall with a recessive gene for dwarf?

____

How many animals would be dwarf? __________

6. Suppose you had a cross involving two pairs of genes for a F_1 and F_2 generation. The bull carried the dominant genes (DDTT) and the cow the recessive genes (ddtt). What would be the F_1 generation cross?

When crossing the offspring of the F_1 generation, what will be the possible gametes in the F_2 generation?



What would be the random assortment of the gene combinations?

7. Suppose you were crossing a modified two-pair ratio and wanted to determine the offspring combination of the F_1 and F_2 generations. The bull carried the polled red dominant genes (PPRR) and the cow carried the recessive genes (pprr) for horned white. Answer each of the following questions and show your work.

a. What would be the gametes of each parent?

Male __________

Female __________

b. What would be the gene combination of the F_1 offspring?

____

ASSIGNMENT SHEET #2

c. By crossing the F_1 offspring, what would be the gametes of each parent?

○ ○ ○ ○ ○ ○ ○ ○

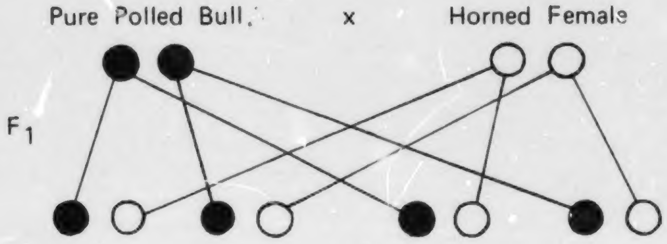
d. What would be the F_2 random assortment of gene combinations?

(NOTE: Also indicate whether horned or polled and the color combination.)

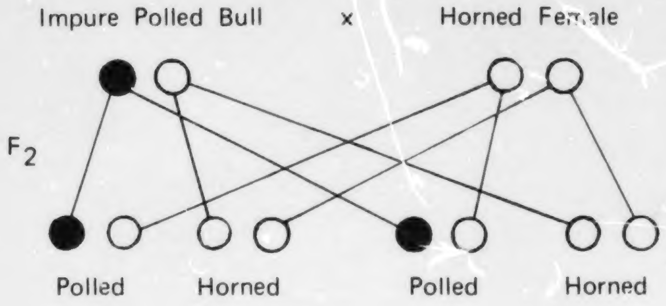
SELECTING AND BREEDING LIVESTOCK
UNIT I

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1



All Offspring Polled



Assignment Sheet #2

1. a.

	B	B
B	BB	BB
B	BB	BB

Genotypic ratio 0:4:0

Phenotypic ratio All black

b.

	B	b
b	Bb	bb
b	Bb	bb

Genotypic ratio 0:2:2

Phenotypic ratio 2 Black
2 Red

c.

	B	b
B	BB	Bb
B	BB	Bb

Genotypic ratio 0:2:2

Phenotypic ratio All black

d.

	b	b
b	bb	bb
b	bb	bb

Genotypic ratio 0:4:0

Phenotypic ratio All red

2.

	p	p
P	Pp	Pp
P	Pp	Pp

Genotypic ratio 0:4:0

Phenotypic ratio All polled

3.

	p	p
P	Pp	Pp
p	pp	pp

Genotypic ratio 0:2:2

Phenotypic ratio 2 polled
2 horned

4.

	P	p
P	PP	Pp
p	Pp	pp

Genotypic ratio 1:2:1

Phenotypic ratio 1 pure polled
2 polled
1 pure horned

5. a.

	D	D
d	Dd	Dd
d	Dd	Dd

a. Dd

b.

	D	d
D	DD	Dd
d	Dd	dd

b. 1 pure tall
2 tall with recessive dwarf gene
1 dwarf

6. Gametes DT dt

F_1 generation DTdt

Gametes of F_2 DT Dt dT dt
DT Dt dT dt

Random assortment of gene combinations

	DT	Dt	dT	dt
DT	DTDT	DTDt	DTdT	DTdt
Dt	DtDT	DtDt	DtdT	Dtdt
dT	dTDT	dTDt	dTdT	dTdt
dt	dtDT	dtDt	dtdT	dtdt

7. a. Male PR

Female pr

b. PRpr

c. Gametes PR Pr pR pr
PR Pr pR pr

Random assortment of gene combinations

	PR	Pr	pR	pr
PR	PRPR polled red	PRPr polled roan	PRpR polled red	PRpr polled roan
Pr	PrPR polled roan	PrPr polled white	PrpR polled roan	Prpr polled white
pR	pRPR polled red	pRPr polled roan	pRpR horned red	pRpr horned roan
pr	prPR polled roan	prPr polled white	prpR horned roan	prpr horned white

SELECTING AND BREEDING LIVESTOCK
UNIT I

TEST

NAME ______________________ SCORE ______________________

1. Match the terms on the right to the correct definitions.

_____ a. Mature germ cell

_____ b. Result of fertilization

_____ c. Classification determined by senses

_____ d. Complex protein molecule that determines hereditary characteristics of living animals; located at definite points on the chromosomes

_____ e. Branch of biology that deals with the heredity and variation of organisms

_____ f. Animal that is a carrier of one dominant and one recessive factor

_____ g. Thread-like structure which exists in pairs and carries genes

_____ h. Division of the body cells

_____ i. Classification from the genetic formula

_____ j. Animal that is pure for a certain characteristic, such as the polled characteristic

_____ k. Symbol which represents the second cross from a mating

_____ l. Division of the sex cells

_____ m. Genetic factor that causes death of the young, either during prenatal life or at birth

_____ n. Union of two unlike gametes

1. Gamete
2. Fertilization
3. Zygote
4. Homozygous
5. Heterozygous
6. Phenotype
7. Genotype
8. Lethal gene
9. Gene
10. Chromosome
11. Mutation
12. Mitosis
13. Meiosis
14. Genetics
15. F_1
16. F_2

_____o. Symbol which represents the first cross from a mating

_____p. Changes that take place in a gene

2. Select from the list below hereditary characteristics that are determined by genes.

_____a. Body size

_____b. Age

_____c. Color of hair coat

_____d. Eye color

_____e. Ability to fatten

3. Match the animals on the right to the correct number of chromosome pairs by placing the correct answers in the spaces provided. (Blanks may have more than one answer.)

_____a. 40 pairs

_____b. 6 pairs

_____c. 30 pairs

_____d. 23 pairs

_____e. 27 pairs

1. Cattle
2. Sheep
3. Swine
4. Humans
5. Chickens
6. Horses

4. Discuss in a short paragraph how the genetic makeup of an animal is determined.

____

____

____

5. Distinguish between dominant and recessive genes. Place a "D" in the blank if the statement indicates a dominant characteristic or an "R" in the blank if the statement indicates a recessive characteristic.

_____a. Genes that are covered up or masked in the F_1 generation

_____b. Genes that have the ability to cover up or mask the presence of one number of a set in the F_1 generation

6. Distinguish between simple gene inheritance and multiple gene inheritance. Place "SG" in the blank if the statement indicates a simple gene inheritance or "MG" in the blank if the statement indicates a multiple gene inheritance.

_____a. One pair of genes is involved

_____b. Several pairs of genes are involved

7. Name the color inheritance of the following matings?

a. Purebred Angus (black) x purebred Hereford ____________________

b. Black breed (Poland China) x red breed (Duroc) ________________

c. Swine belted breed x red or black breed ____________________

d. Brahman (steel gray) x Shorthorn (red) ____________________

8. Discuss in a short paragraph how the sex of the offspring is determined.

____

____

____

____

____

9. Define *dwarfism* as it relates to livestock breeding.

____

____

____

____

____

10. Distinguish between performance testing and progeny testing by placing "PE" if the statement indicates performance testing or "PR" if the statement indicates progeny testing.

_____a. Practice of selecting animals on the basis of the merit of their progeny (offspring)

_____b. Practice of evaluating and selecting animals on the basis of their individual merit or performance

11. Match different systems of livestock breeding to the correct definitions.

_____a. System of breeding in which closely related animals are mated

_____b. Mating of animals that are members of the same breed but which show no relationship close up in the pedigree

_____c. Member of a breed; animals which possess a common ancestry and distinctive characteristics and are either registered or eligible for registry in the herd book of that breed

_____d. Mating of animals of different breeds

_____e. System of breeding in which purebred sires of a given pure breed are mated to native or grade females

1. Crossbreeding
2. Purebred
3. Inbreeding
4. Grading up
5. Outcrossing

12. Draw a diagram showing the inheritancy of horns in cattle for the F_1 and F_2 generations.

13. Estimate the possible gene combinations if you mated a polled bull (Pp) carrying a recessive gene for horns to a polled cow (Pp) carrying a recessive gene for horns.

a. How many pure polled? ________________________

b. How many polled with recessive genes for horns? __________

c. How many pure horned? ________________________

SELECTING AND BREEDING LIVESTOCK
UNIT I

ANSWERS TO TEST

1. a. 1
   b. 3
   c. 6
   d. 9
   e. 14
   f. 5
   g. 10
   h. 12
   i. 7
   j. 4
   k. 16
   l. 13
   m. 8
   n. 2
   o. 15
   p. 11

2. a, c, d, e

3. a. 3
   b. 5
   c. 1, 6
   d. 4
   e. 2

4. The discussion should include that the genetic makeup is determined by the union of two cells, one from each parent

5. a. R
   b. D

6. a. SG
   b. MG

7. a. Black with white face
   b. Black and red spotted
   c. Belted and some solid black
   d. Red

8. Discussion should include:

   a. Eggs of female contain like chromosomes known as *X* chromosomes

   b. Sperm of male contains unlike chromosomes known as *X* and *Y* chromosomes

   c. Egg and sperm unite randomly

      1) If egg and sperm contain like chromosomes (X and Y), a female is conceived

      2) If egg and sperm contain unlike chromosomes, (X and Y), a male is conceived

9. *Dwarfism* is an inherited characteristic of cattle caused by a genetic origin but not carried by the sex chromosomes

10. a. PR

    b. PE

11. a. 3

    b. 5

    c. 2

    d. 1

    e. 4

12. Evaluated to the satisfaction of the instructor

13. a. one

    b. two

    c. one

	P	p
P	PP	Pp
p	Pp	pp

REPRODUCTIVE ORGANS OF FARM ANIMALS
UNIT II

UNIT OBJECTIVE

After completion of this unit, the student should be able to identify the parts of the reproductive tract of a cow and match male and female reproductive organs to the correct functions. This knowledge will be evidenced by completion of the assignment sheet and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with the reproductive organs of farm animals to the correct definitions.
2. Select from a list the components of the male reproductive tract.
3. Select from a list the main functions of the epididymis.
4. Match male reproductive organs to the correct functions.
5. Identify the parts of the reproductive tract of a cow.
6. Match the parts of the female reproductive tract to the correct functions.
7. Select from a list two hormones produced by the ovaries.
8. Name the primary organs of reproduction in the male and female.

REPRODUCTIVE ORGANS OF FARM ANIMALS
UNIT II

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

  A. Provide student with objective sheet.

  B. Provide student with information and assignment sheets.

  C. Make transparencies.

  D. Discuss unit and specific objectives.

  E. Discuss information and assignment sheets.

  F. Secure a reproductive tract of a cow from a slaughterhouse to show class.

  G. Construct a crossword puzzle for the functions of male or female reproductive organs.

  H. Arrange a field trip to veterinary clinic to view different parts of the reproductive organs.

  I. Use the concentration game to review student on the parts and functions of the reproductive organs.

  J. Give test.

  K. Reteach if necessary.

II. Instructional materials:

  A. Objective sheet

  B. Information sheet

  C. Transparency masters

    1. TM 1--Reproductive Tract of a Bull

    2. TM 2--Reproductive Tract of a Cow

    3. TM 3--Reproductive Tract of a Sow

    4. TM 4--Reproductive Tract of a Mare

  D. Assignment Sheet #1--Identify Parts of Female Reproductive Tract

  E. Answers to assignment sheet

  F. Test

  G. Answers to test

III. Unit references:

A. Hafez, E. S. E., ed. *Reproduction in Farm Animals*. Philadelphia: Lea and Febiger Publishers, Inc., 1962.

B. Stamm, G. W. *Artificial Breeding and Livestock Improvement*. Chicago: Windsor Press, n.d.

REPRODUCTIVE ORGANS OF FARM ANIMALS
UNIT II

INFORMATION SHEET

I. Terms and definitions

   A. Estrus--Period during which female is receptive to courtship and copulation

   B. Embryo--Young organism in the early stages of development

   C. Gonad--Primary sex gland; ovary or testis

   D. Zygote--Cell produced by the union of sperm and ovum at fertilization

   E. Ejaculation--Movement of sperm from the epididymis through the penis into the female

   F. Hormone--Internal body secretion that aids in reproduction

   G. Fertilization--Uniting of the male and female germ cells

   H. Fimbria--Opening to the Fallopian tube which catches the egg as it leaves the ovary

   I. Cryptorchid male--Male animal which is sterile because the testicles did not descend into the scrotum

   J. Progesterone--Hormone necessary to synchronize estrus

   K. Fetus--Young animal in the uterus from time of complete tissue differentiation until birth

   (NOTE: An animal goes through three stages of development in the uterus before birth--zygote, embryo, and fetus.)

II. Components of male reproductive tract

   A. Primary sex organs--Gonads (testes or testicles)

   B. Accessory sex organs

      1. Epididymis

      2. Vesicular glands

      3. Prostate

   C. Copulatory organ--Penis

INFORMATION SHEET

III. Functions of the epididymis

   A. Transportation of sperm

   B. Concentration of sperm

   C. Maturation of sperm

   (NOTE: This is the final stage in the development of gametes [sperm] in which the normal number of chromosomes is reduced by one-half.)

   D. Storage of sperm

IV. Functions of male reproductive organs (Transparency 1)

   A. Testes--Produce spermatozoa, the male germ cells

   B. Epididymis--Collects and stores the sperm

   C. Vas deferens--Transports spermatozoa; serves as storage place for spermatozoa until ejaculation

   D. Ampulla--Produces fructose and citric acid

   E. Penis--Transports sperm from the male to the female

   F. Urethra--Transports urine

   G. Cowpers gland--Secretes an alkaline material which serves to clean the urethra prior to ejaculation; produces a lubricating substance

   H. Prostate gland--Secretes a high mineral composition that becomes a part of the semen

   (NOTE: Composition and function are unknown.)

   I. Seminal vesicle--Secretes a substance high in simple sugar (fructose) which serves as a nutrient for spermatozoa transport

   J. Retractor penis muscle--Extends and retracts the penis during copulation

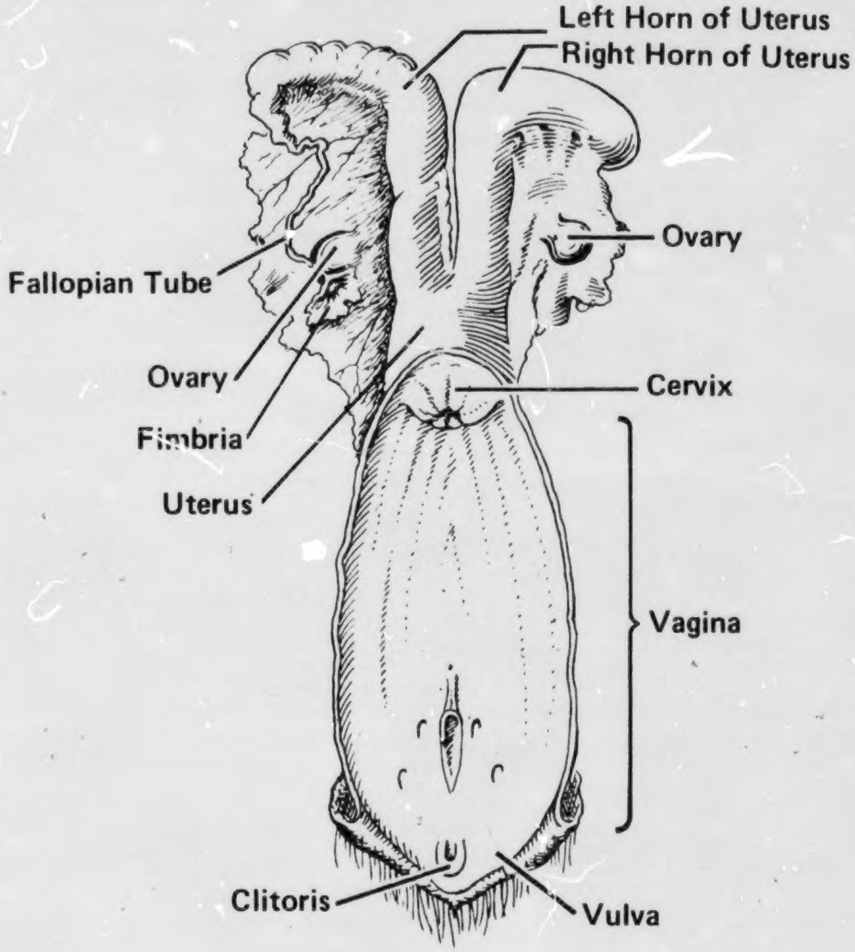
   K. Scrotum--Maintains the temperature [illegible] the testes; serves as protection for the testes

   L. Sheath--Provides opening to the male reproductive tract

   M. Spermatic cord--Supports the testes

INFORMATION SHEET

V. Parts of the female reproductive tract (Transparencies 2, 3, and 4; Assignment Sheet #1)



VI. Functions of parts of female reproductive tract

A. Vulva--Serves as opening of the female reproductive tract

B. Clitoris--Increases sexual excitement of female during copulation

C. Vagina--Serves as channel for birth of fetus; receives male penis during copulation

D. Cervix--Serves as a divider between the vagina and the uterus; secretes a fluid or mucus that forms a plug at end of cervix inside the uterus when pregnancy occurs

INFORMATION SHEET

E. Uterus--Provides place for fetal development at later stages of pregnancy

F. Horns of uterus--Serves as place for embryo to develop into a fetus

G. Fallopian tube--Serves as place where fertilization occurs

H. Ovaries--Produce eggs, the female germ cells

VII. Hormones produced by ovaries

A. Estrogen

(NOTE: An increase in estrogen causes the nervous system to produce behavioral estrus.)

B. Progesterone

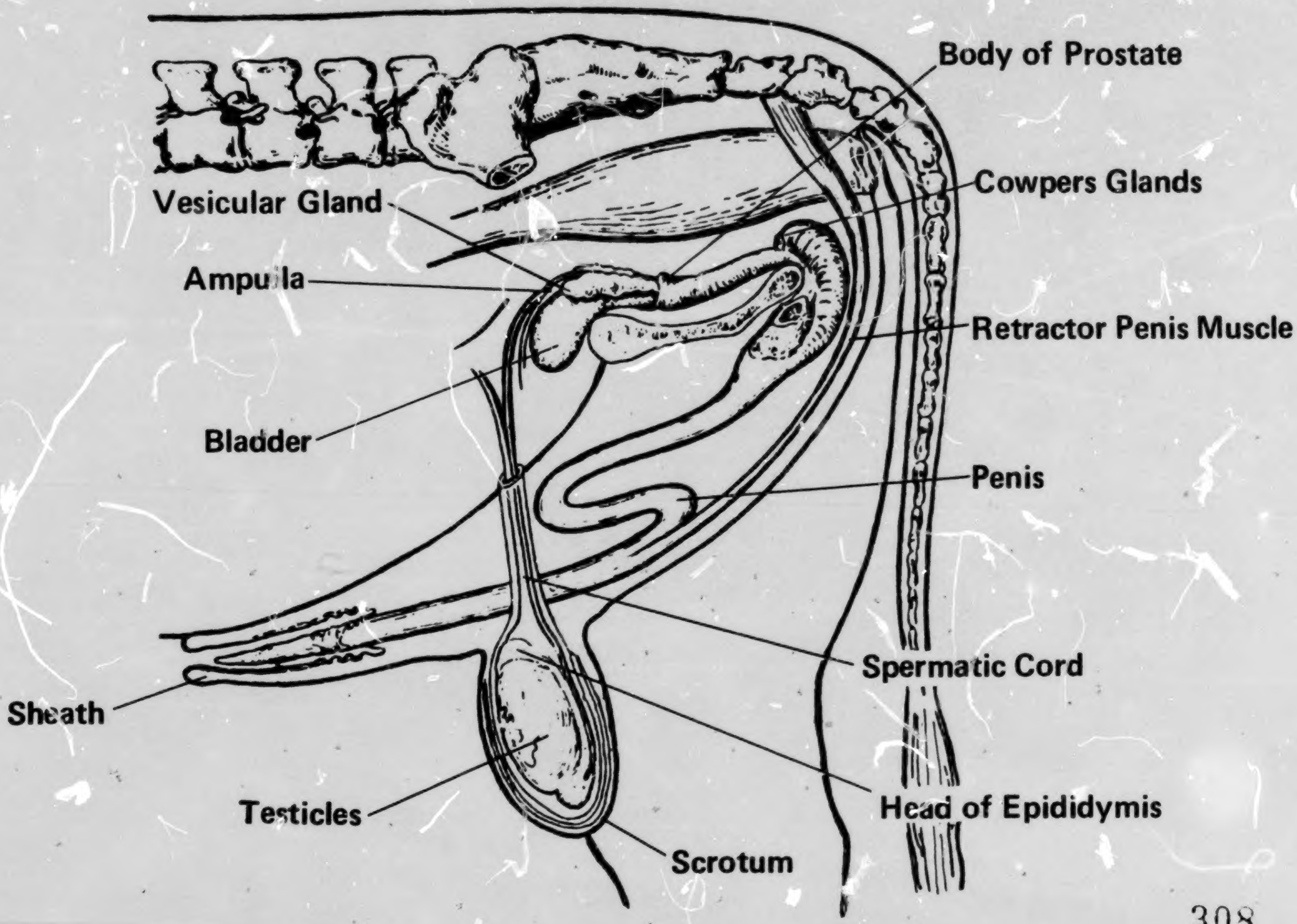
(NOTE: When ovulation is completed, the corpus luteum is formed and begins to secrete progesterone to take the animal out of heat.)

VIII. Primary organs of reproduction

A. Male--Testes

B. Female--Ovaries

Reproductive Tract of a Bull



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TM 1

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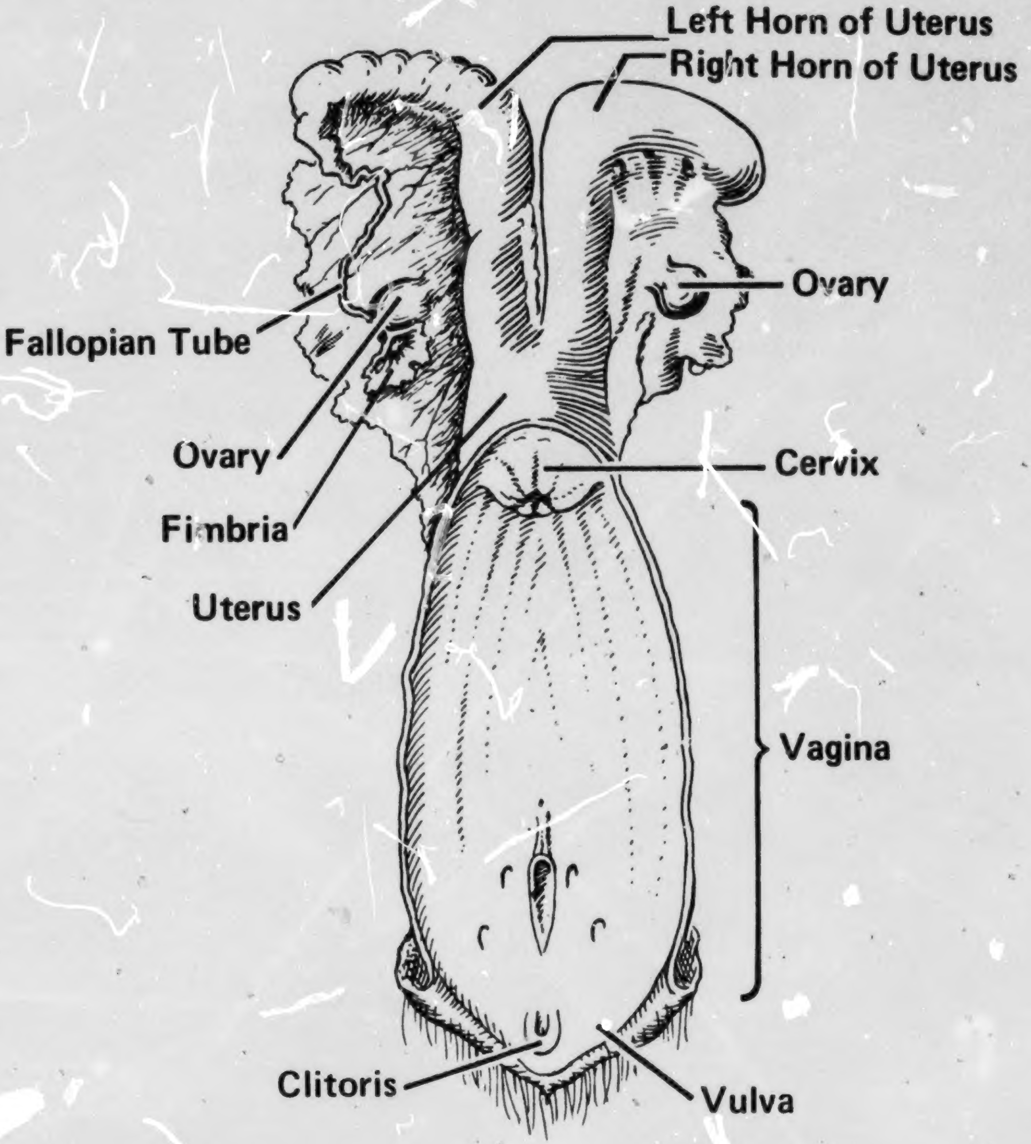
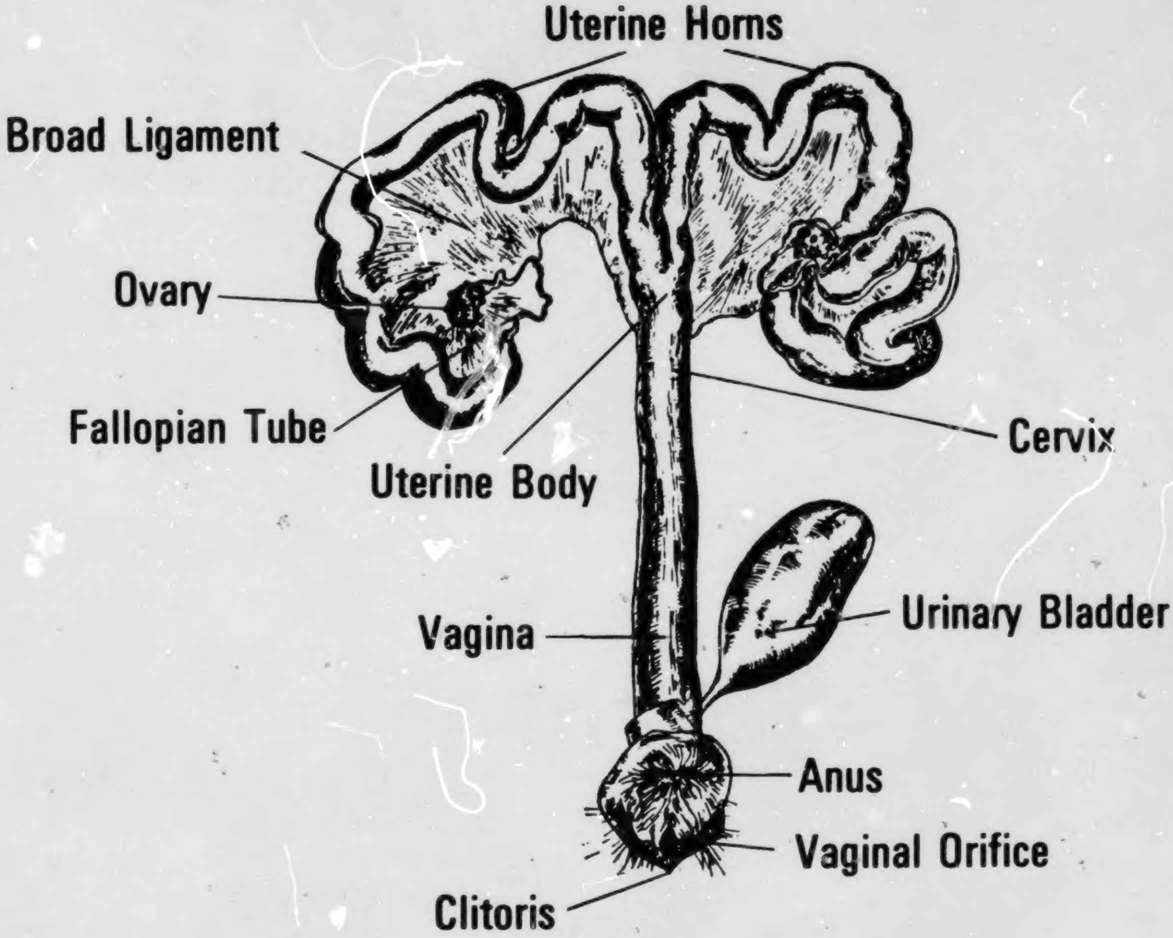
Ag III - 43-C

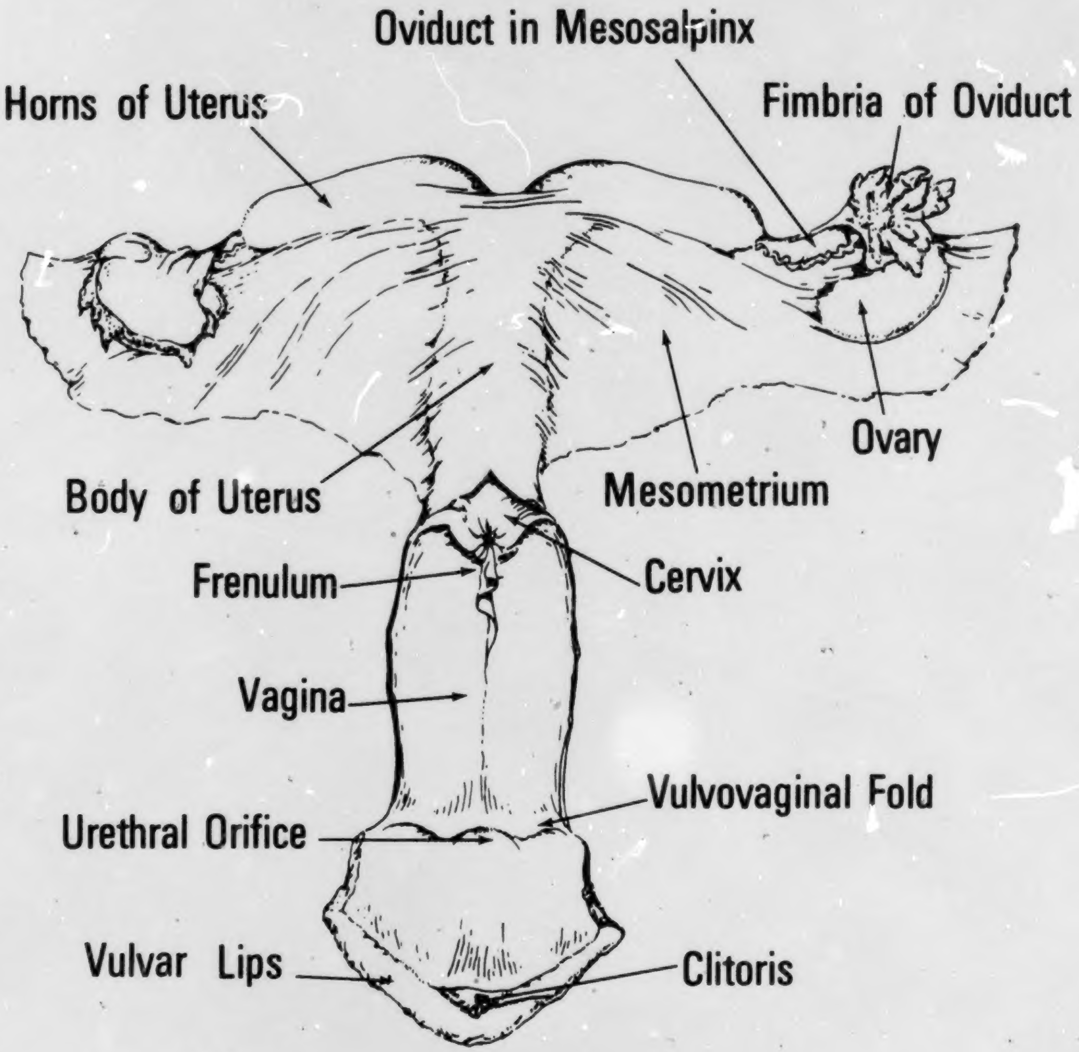
Reproductive Tract of a Cow



Reproductive Tract of a Sow



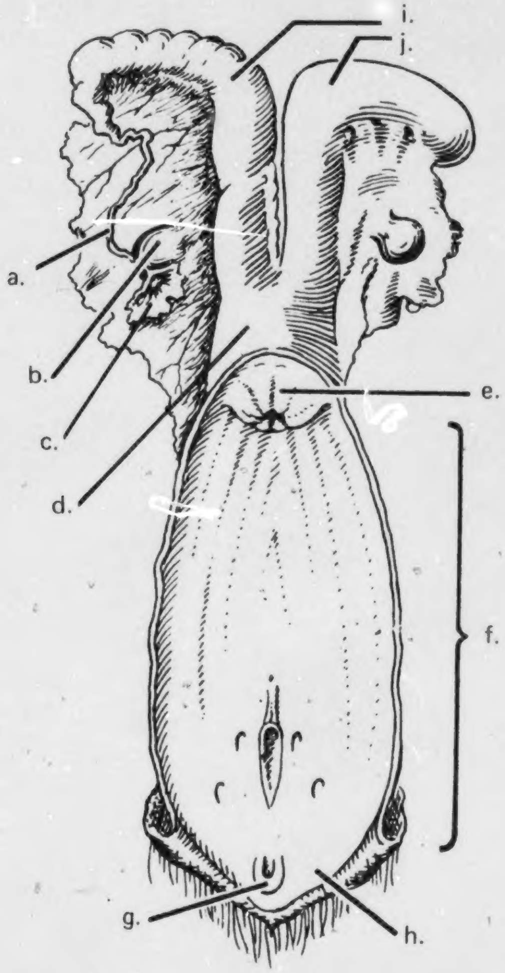
Reproductive Tract of a Mare



REPRODUCTIVE ORGANS OF FARM ANIMALS
UNIT II

ASSIGNMENT SHEET #1--IDENTIFY PARTS OF FEMALE REPRODUCTIVE TRACT

Use the drawing below and a female reproductive tract from a slaughterhouse to identify the parts of the female reproductive tract and answer the questions on the following page.



1. a. ______________________ f. ______________________

b. ______________________ g. ______________________

c. ______________________ h. ______________________

d. ______________________ i. ______________________

e. ______________________ j. ______________________

ASSIGNMENT SHEET #1

2. a. What part of the reproductive tract is responsible for the production of the egg cell?

   b. What serves as a divider between the vagina and the uterus?

   c. What part of the female reproductive tract serves as the channel for the birth of the fetus and receives the male penis during copulation?

   d. Where in the reproductive tract does fertilization occur?

REPRODUCTIVE ORGANS OF FARM ANIMALS
UNIT II

ANSWERS TO ASSIGNMENT SHEET

1. a. Fallopian tube
   b. Ovary
   c. Fimbria
   d. Uterus
   e. Cervix
   f. Vagina
   g. Clitoris
   h. Vulva
   i. Left horn of uterus
   j. Right horn of uterus
2. a. Ovaries
   b. Cervix
   c. Vagina
   d. Fallopian tube

REPRODUCTIVE ORGANS OF FARM ANIMALS
UNIT II

TEST

NAME ______________________________ SCORE ____________________

1. Match the terms on the right to the correct definitions.

_____a. Internal body secretion that aids in reproduction

_____b. Opening to the Fallopian tube which catches the egg as it leaves the ovary

_____c. Male animal which is sterile because the testicles did not descend into the scrotum

_____d. Period during which female is receptive to courtship and copulation

_____e. Cell produced by the union of sperm and ovum at fertilization

_____f. Hormone necessary to synchronize estrus

_____g. Uniting of the male and female germ cells

_____h. Primary sex gland; ovary or testis

_____i. Movement of sperm from the epididymis through the penis into the female

_____j. Young organism in the early stages of development

_____k. Young animal in the uterus from time of complete tissue differentiation until birth

1. Estrus
2. Embryo
3. Gonad
4. Zygote
5. Ejaculation
6. Fetus
7. Fertilization
8. Fimbria
9. Cryptorchid male
10. Progesterone
11. Hormone

2. Select from the following list components of the male reproductive tract.

_____a. Epididymis

_____b. Gonads (testes or testicles)

_____c. Vesicular glands

_____d. Prostate

_____e. Embryo

3. Select from the following list the main functions of the epididymis.

______a. Storage of sperm

______b. Transportation of sperm

______c. Dilution of sperm

______d. Maturation of sperm

______e. Concentration of sperm

4. Match the male reproductive organs on the right to the correct functions.

______a. Transports sperm from the male to the female

______b. Secretes a substance high in simple sugar (fructose) which serves as a nutrient for spermatozoa transport

______c. Supports the testes

______d. Produces spermatozoa, the male germ cells

______e. Provides opening to the male reproductive tract

______f. Produces fructose and citric acid

______g. Secretes an alkaline material which serves to clean the urethra prior to ejaculation; produces a lubricating substance

______h. Collects and stores the sperm

______i. Extends and retracts the penis during copulation

______j. Transports urine

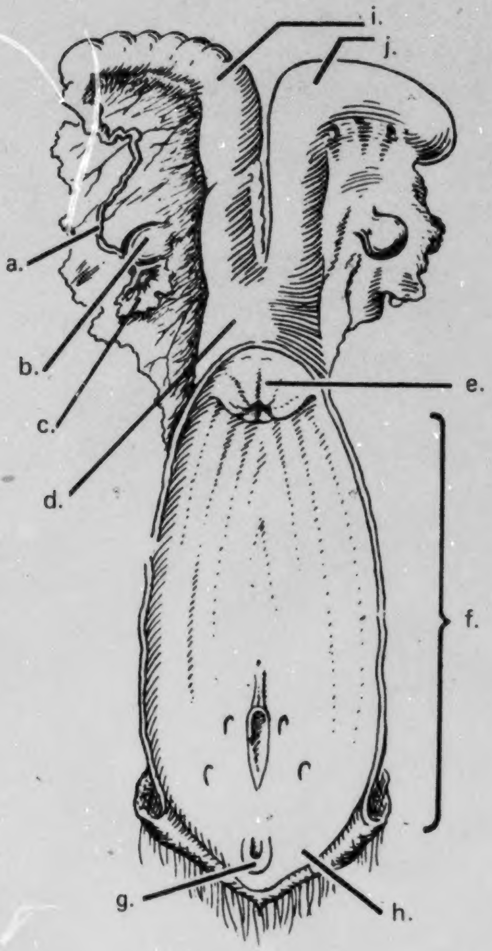
______k. Transports spermatozoa; serves as storage place for spermatozoa until ejaculation

______l. Maintains the temperature of the testes; serves as protection for the testes

______m. Secretes a high mineral composition that becomes a part of the semen

1. Testes
2. Epididymis
3. Vas deferens
4. Ampulla
5. Penis
6. Urethra
7. Cowpers gland
8. Prostate gland
9. Seminal vesicle
10. Retractor penis muscle
11. Scrotum
12. Sheath
13. Spermatic cord

5. Identify the parts of the female reproductive tract below by writing the correct names in the blanks provided.



a. ____________________

b. ____________________

c. ____________________

d. ____________________

e. ____________________

f. ____________________

g. ____________________

h. ____________________

i. ____________________

j. ____________________

6. Match the parts of the female reproductive tract on the right to the correct functions.

______a. Serves as place where fertilization occurs

______b. Serves as channel for birth of fetus; receives male penis during copulation

______c. Produces eggs, the female germ cells

______d. Serves as opening of the female reproductive tract

______e. Provides place for fetal development at later stages of pregnancy

______f. Serves as a divider between the vagina and the uterus; secretes a fluid or mucus that forms a plug at end of cervix inside the uterus when pregnancy occurs

______g. Increases sexual excitement of female during copulation

______h. Serves as place for embryo to develop into a fetus

1. Vulva
2. Clitoris
3. Vagina
4. Cervix
5. Uterus
6. Horns of uterus
7. Fallopian tube
8. Ovaries

7. Select from the following list two hormones that are produced by the ovaries.

______a. Adrenalin

______b. Estrogen

______c. Bile

______d. Progesterone

8. Name the primary organs of reproduction in the male and female.

a. Male- ______________________________

b. Female-- ______________________________

REPRODUCTIVE ORGANS OF FARM ANIMALS
UNIT II

ANSWERS TO TEST

1. a. 11
   b. 8
   c. 9
   d. 1
   e. 4
   f. 10
   g. 7
   h. 3
   i. 5
   j. 2
   k. 6
2. a, b, c, d
3. a, b, d, e
4. a. 5
   b. 9
   c. 13
   d. 1
   e. 12
   f. 4
   g. 7
   h. 2

i. 10
j. 6
k. 3
l. 11
m. 8

5. a. Fallopian tube
b. Ovary
c. Fimbria
d. Uterus
e. Cervix
f. Vagina
g. Clitoris
h. Vulva
i. Left horn of uterus
j. Right horn of uterus

6. a. 7
b. 3
c. 8
d. 1
e. 5
f. 4
g. 2
h. 6

7. b, d

8. a. Male--Testes
b. Female--Ovaries

ARTIFICIAL INSEMINATION
UNIT III

UNIT OBJECTIVE

After completion of this unit, the student should be able to select advantages and disadvantages of using artificial insemination. The student should be able to discuss the signs of estrus cycle and demonstrate the proper procedures for inseminating cattle. This knowledge will be evidenced by completion of assignment sheets, job sheets, and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with artificial insemination to the correct definitions.
2. Select from a list the advantages of using artificial insemination.
3. Select from a list the disadvantages of using artificial insemination.
4. Name sources of semen for use in artificial insemination.
5. List the characteristics of semen such as color, volume, pH, and sperm cell concentration.
6. Select from a list factors that influence volume of semen produced.
7. Identify the parts of a sperm cell when given a drawing.
8. Name types of abnormal sperm.
9. Discuss the signs of estrus in cows.
10. State which sign of estrus is the most important in regard to time of insemination.
11. Match farm animals to their normal estrus cycles.
12. Name the time when a cow ovulates.
13. Select from a list factors that contribute to poor conception rates.
14. Select from a list the reasons why timing is important when using artificial insemination.

15. Match given animals to the correct gestation period in days.

16. Match the percentage of pregnancies expected to the number of services when using artificial insemination in cattle.

17. Select from a list functions of the ovary.

18. Name functions of the mucous fluid.

19. Name reasons why cattle do not settle.

20. Match methods of thawing semen to the correct procedures.

21. Identify equipment necessary for artificial insemination.

22. Identify errors in inseminating a cow with relationship to the misplacement of the inseminating tube.

23. Examine semen for mobility and abnormalities.

24. Identify points in time on an estrus cycle chart.

25. Demonstrate the ability to:

    a. Place inseminating tube and dye into reproductive tract acquired from slaughterhouse.

    b. Inseminate a cow.

ARTIFICIAL INSEMINATION
UNIT III

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

   A. Provide student with objective sheet.

   B. Provide student with information, assignment, and job sheets.

   C. Make transparencies.

   D. Discuss unit and specific objectives.

   E. Discuss information sheet.

   F. Obtain reproductive tracts from slaughterhouse.

   G. Demonstrate the procedure for inseminating cattle on a reproductive tract from slaughterhouse using dye to illustrate where you would deposit semen in the tract.

   H. Contact local artificial inseminator to assist with demonstration, to serve as resource person, and to provide necessary equipment.

   I. Give test.

II. Instructional materials:

   A. Objective sheet

   B. Information sheet

   C. Transparency masters

      1. TM 1--Parts of Sperm Cell

      2. TM 2--Signs of Estrus (Cow)

      3. TM 3--Time of Insemination and Conception Rate (Mare)

      4. TM 4--Signs of Estrus (Sow)

      5. TM 5--Tools Used in Inseminating

      6. TM 6--Errors in Placing Inseminating Tube

   D. Assignment sheets

      1. Assignment Sheet #1--Examine Semen for Mobility and Abnormalities

      2. Assignment Sheet #2--Identify Points in Time on an Estrus Cycle Chart

E. Answers to assignment sheets

F. Job sheets

   1. Job Sheet #1--Inseminate Reproductive Tract Acquired from Slaughterhouse

   2. Job Sheet #2--Inseminate a Cow

G. Test

H. Answers to test

III. Unit references:

A. Hafez, E. S. E., ed. *Reproduction in Farm Animals.* Philadelphia: Lea and Febiger, 1962.

B. Stamm, G. W. *Artificial Breeding and Livestock Improvement.* Chicago: Windsor Press, n.d.

ARTIFICIAL INSEMINATION
UNIT III

INFORMATION SHEET

I. Terms and definitions

   A. Artificial insemination--Means of obtaining pregnancy without the use of a natural service

   B. Pregnancy--Term used to indicate that an animal is carrying a young fetus

   C. Fertilization--Uniting of the female and male germ cells

   D. Gestation--Length of time from fertilization until birth

   E. Conception--Female and male germ cells meeting and fertilization occurring without future heat cycles

   F. Estrus cycle--Time elapsing from one heat period to the next

   G. Inseminating tube--Tube used to place sperm into a female's reproductive tract

   H. Hormone--Internal body secretion that aids in reproduction

   Examples: Estrogen, progesterone

II. Advantages of using artificial insemination

   A. Improvement of herd

   B. Wider selection of sires

   C. Prevention of disease spread

   D. Increase in offspring uniformity

   E. Reduced cost of keeping sire

   F. Safety

III. Disadvantages of using artificial insemination

   A. Skilled technician required

   B. Closer supervision of female required

   (NOTE: Cattle need to be supervised two to three times per day to detect heat.)

   C. More equipment needed

INFORMATION SHEET

IV. Sources of semen for artificial insemination

- A. Studs
- B. Collecting own sire
- C. Buying direct from breeder

V. Characteristics of semen

- A. Color--White to cream, with variations from clear to yellow
- B. Volume--From 2 to 6 cubic centimeters
- C. pH--Range of 6.5 to 6.9
- D. Sperm cell concentration--Considerable variations among males

  (NOTE: Sperm cell concentration varies according to age, season of year, and condition of animals.)

VI. Factors that influence volume of semen produced

- A. Age
- B. Size
- C. Health
- D. Frequency of collection

VII. Parts of sperm cell (Transparency 1, Assignment Sheet #1)

- A. Head
- B. Neck
- C. Middle piece

  (NOTE: The middle piece of the sperm cell serves as a storage house for energy.)

- D. Tail

  (NOTE: The tail is used to propel the sperm.)

INFORMATION SHEET

VIII. Types of abnormal sperm

- A. Tailless head
- B. Two heads
- C. Two tails
- D. Pear-shaped head

IX. Signs of estrus (Transparencies 2, 3, and 4; Assignment Sheet #2)

- A. Standing to be ridden
- B. Riding others
- C. Nervousness; restlessness
- D. Clear, sticky mucus flowing from vulva
- E. Minor indications
  - 1. Dirt or mud on flanks or back
  - 2. Hair standing up on tail head
  - 3. Bellowing
  - 4. Holding up milk

X. Most important indication of estrus--Standing to be ridden

XI. Normal estrus cycles for cows, mares, and sows

- A. Cow--18 to 24 days

  (NOTE: The duration of estrus standing heat is 16 to 18 hours but may vary from 6 to 35 hours. The first estrus after calving will vary from 45 to 60 days, depending on age and nutritional level of cow.)

- B. Sow--19 to 23 days
- C. Mare--16 to 24 days

XII. Ovulation of a cow--Occurs 8 to 10 hours after standing heat

(NOTE: If a cow is noticed in standing heat during the morning, she should be inseminated in the afternoon.)

INFORMATION SHEET

XIII. Factors that contribute to poor conception rates

- A. Improper timing
- B. Disease

  Examples: Vibriosis, vaginitis, trichomoniasis, Bang's, lepto

- C. Poor insemination technique
- D. Management failure
- E. Ovulation failure

XIV. Reasons why timing is important

- A. Sperm must be in the Fallopian tube six hours before ovulation occurs

  (NOTE; If cow is inseminated too early, sperm dies. If done too late, the egg is gone.)

- B. Cervical reaction or uterine contraction must be present

XV. Gestation periods

(NOTE: The following gestation periods are based on an average.)

- A. Cow--283 days
- B. Mare--336 days
- C. Sow--114 days
- D. Ewe--150 days

XVI. Percentage of pregnancies expected

- A. First service--65% to 70%
- B. Second service--70% to 85%
- C. Third service--85% to 95%

(NOTE: The remaining 5% are problem cows, non-breeders.)

XVII. Functions of ovary

- A. Produces the egg
- B. Produces hormone estrogen

  (NOTE: Higher levels of estrogen in bloodstream bring cow in heat.)

INFORMATION SHEET

C. Moves sperm through the reproductive tract

D. Builds nest for embryo

E. Produces hormone progesterone

(NOTE: This hormone takes the cow out of heat.)

XVIII. Functions of mucous fluid

A. Serves as cleansing agent

B. Serves as stream for passage of sperm

XIX. Reasons cattle do not settle

A. Ovulation failure

B. Delayed ovulation

C. Failure of follicle to rupture

D. Stimulant not moving sperm

XX. Methods of thawing semen

A. Straw

1. Hot bath--Place in water bath at 90° to 95° for one minute

2. Ice bath--Place in water bath at 37°F for 8 to 10 minutes

3. No thaw--Take straight from nitrogen tank without thawing and inseminate

(CAUTION: Many stud organizations are recommending different methods of thawing semen. However, it appears that all are reporting that the hot bath is the most desirable. Please check with your semen supplier about the correct method.)

B. Ampules

1. Hot bath--Place in water bath at [illegible]F for 40 seconds

2. Ice bath--Place in water bath at 37°F for 10 minutes

XXI. Equipment used in inseminating (Transparency 5)

A. Nitrogen chest

B. Thaw box

C. Inseminating tube

INFORMATION SHEET

D. Disposable gloves

E. Polybulb

F. Straw clippers

G. Ampule

H. Straw

XXII. Errors in placing inseminating tube (Transparency 6)

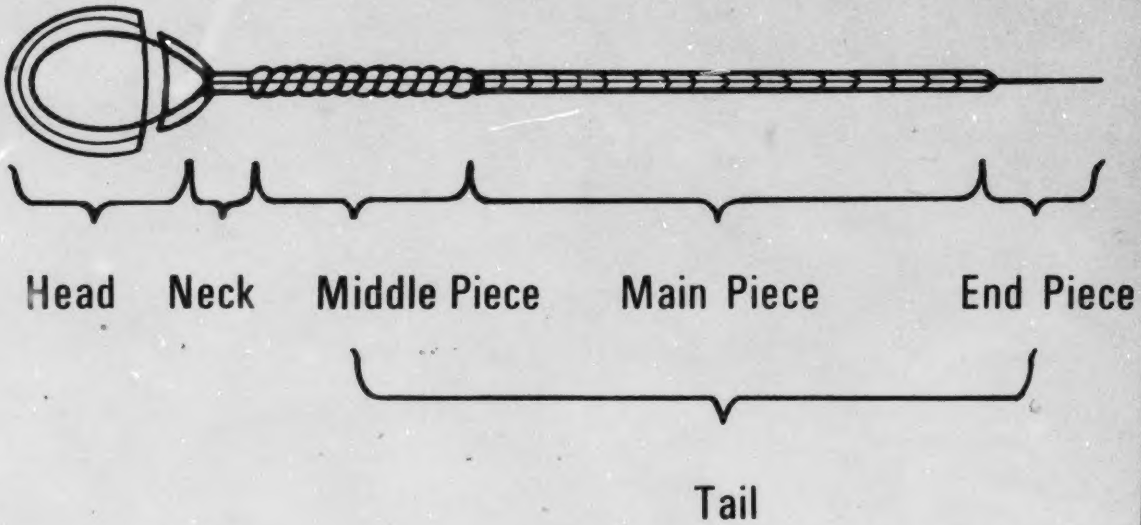
A. Tube placed in blind cavity of cervix

B. Tube placed in urethra

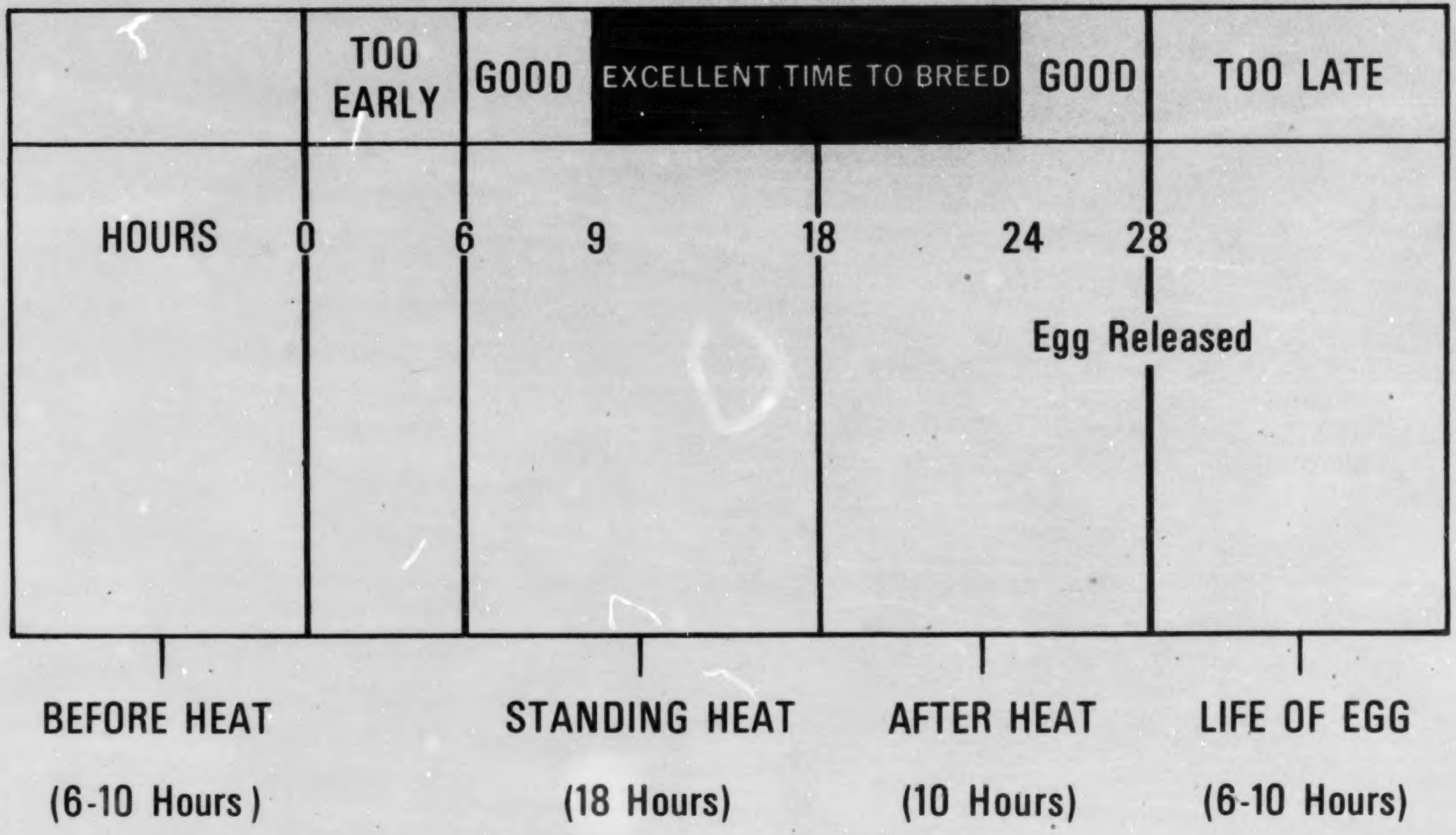
C. Tube placed in fold of vaginal wall

D. Tube placed in prolapsed cervix

Parts of Sperm Cell



Signs of Estrus (Cow)



TM 2

Ag III - 73-C

Time of Insemination and Conception Rate (Mare)

	Days Before Ovulation					Day Of Ovulation				Days After Ovulation		
	−5	−4	−3	−2	−1		0			1		3
Mare Inseminated	30	20	89	124	164		256			13		1
Conception Rate %	10	40	52	65	60		60			54		0

Note: It Appears That The Conception Rate Was The Highest Two Days Before Ovulation, With One Day Before Ovulation And The Day Of Ovulation Being The Same.

Signs of Estrus (Sow)

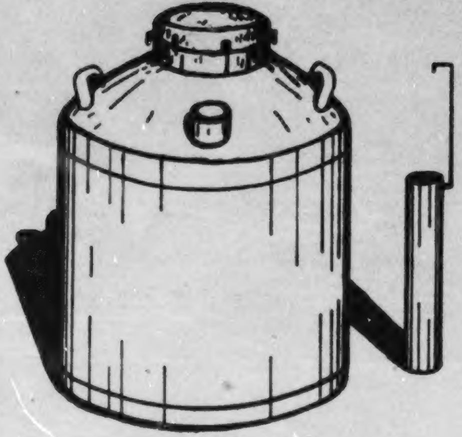
	TOO EARLY	GOOD	EXCELLENT TIME TO BREED	TOO LATE
HOURS	10 15	20 25	30 35	40
			Egg Released	

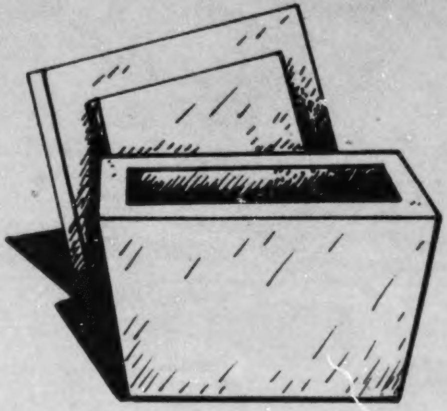
6-12 Hours
BEFORE HEAT

24-36 Hours
STANDING HEAT

12 Hours
AFTER HEAT

Tools Used in Inseminating


Nitrogen Chest


Thaw Box

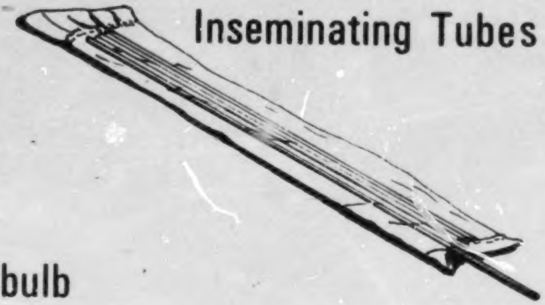
Ampule

Straw Clippers

Straw

Disposable Gloves

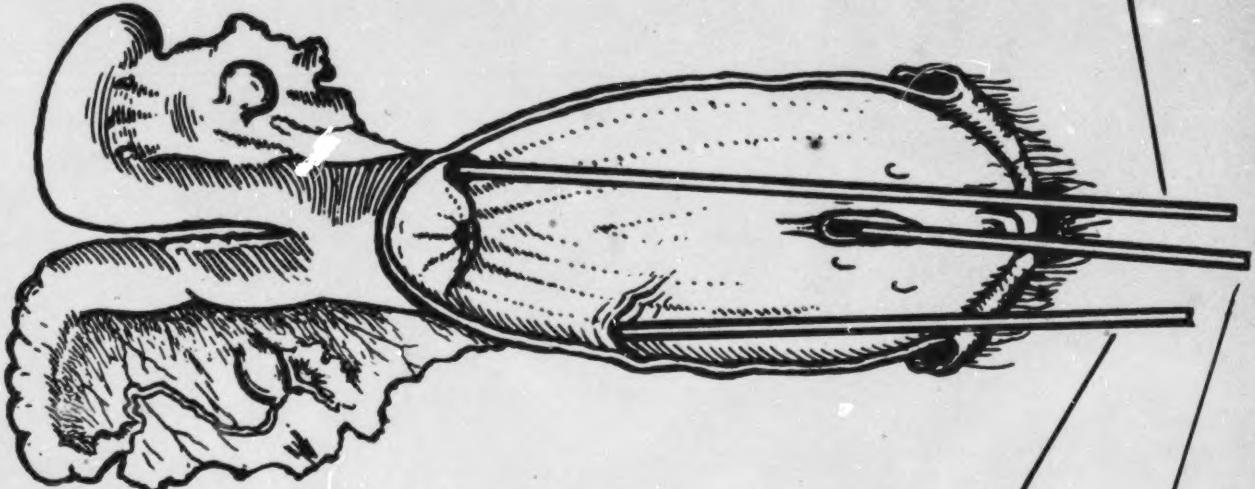
Polybulb


Inseminating Tubes

TM 5

Ag III - 79-C

Errors in Placing Inseminating Tube



Tube Placed in Blind Cavity of Cervix

Tube Placed in Fold of Vaginal Wall

Tube Placed in Urethra

ARTIFICIAL INSEMINATION
UNIT III

ASSIGNMENT SHEET #1--EXAMINE SEMEN FOR MOBILITY AND ABNORMALITIES

Check a sample of semen under the microscope for mobility and to determine if any of the sperm cells are abnormal. When finished with the evaluation, complete the lab sheet below and turn in to the instructor for grading.

Lab Sheet Semen Evaluation

Semen sample no. ____________________

Color of semen ____________________

Mobility of Sperm Cells

Progressive ____________ Rotary ____________

Oscillatory ____________

Abnormal Sperm Found

Tailless head ____________ Two heads ____________

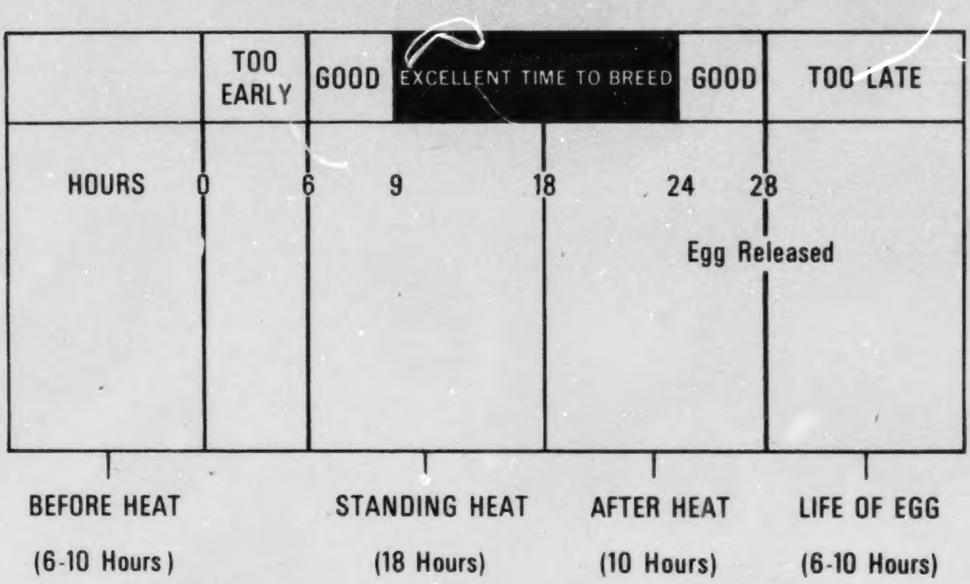
Two tails ____________ Pear-shaped head ____________

ARTIFICIAL INSEMINATION
UNIT III

ASSIGNMENT SHEET #2--IDENTIFY POINTS IN TIME ON AN ESTRUS CYCLE CHART

From the chart below identify the different points in time that estrus occurs in the cow. Answer each of the questions by using the chart.

Signs of Estrus (Cow)



1. When is it too early to inseminate? ______________________
2. When is the best time to inseminate? ______________________
3. When is the egg released from the ovary? ______________________
4. When is it too late to inseminate? ______________________
5. After start of estrus when will a cow stand to be ridden by other cows? __________ Variation in hours ______________________

ARTIFICIAL INSEMINATION
UNIT III

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1--Evaluated to satisfaction of instructor

Assignment Sheet #2

1. At first sign of estrus
2. Eight to ten hours after standing heat
3. Approximately 28 hours after start of estrus
4. After egg is released
5. Approximately six to nine hours with variation of up to 18 hours, depending on weather and cow

ARTIFICIAL INSEMINATION
UNIT III

JOB SHEET #1--INSEMINATE REPRODUCTIVE TRACT ACQUIRED FROM SLAUGHTERHOUSE

I. Equipment and materials

   A. Disposable glove

   B. Inseminating tube

   C. Polybulb or syringe

   D. Bottle of dye

   E. Scissors

   F. Box with paper towels

   G. Dead cow tract

II. Procedure

   A. Place glove on left arm

   (NOTE: Place glove on right arm if you are left-handed.)

   B. Depress polybulb, place in dye, and slowly release bulb to fill

   C. Place left hand over cervix as if in cow

   D. Insert tube into the vulva with right hand, guiding tube through the three rings of the cervix

   E. Deposit dye by depressing the polybulb when past the third ring on the cervix

   (NOTE: Count slowly to ten while depressing the polybulb.)

   F. Remove tube

   G. Cut open the dead tract with scissors to locate the point of deposit of dye

   (NOTE: The dye should be deposited somewhere between the third and fourth rings of the cervix.)

ARTIFICIAL INSEMINATION
UNIT III

JOB SHEET #2--INSEMINATE A COW

I. Tools and equipment

- A. Nitrogen chest
- B. Ampule of semen
- C. Thaw box
- D. Disposable glove
- E. Inseminating tube
- F. Polybulb or syringe
- G. Lubricant
- H. Paper towel

II. Procedure

- A. Place cow in chute
- B. Remove ampule from nitrogen chest
- C. Place ampule in thaw box

  (NOTE: Frozen semen must be thawed in ice water for ten minutes before being used in insemination.)
- D. Place disposable glove on left arm

  (NOTE: Place glove on right arm if you are left-handed.)
- E. Place polybulb or syringe on end of inseminating tube
- F. Open ampule of semen
- G. Depress polybulb or syringe, place in ampule, and slowly release to draw semen into tube

  (NOTE: Cut open the top of ampule by scribing knife blade around top on the etch mark.)
- H. Place syringe in mouth with tube in horizontal position

  (NOTE. This will leave both hands free.)

JOB SHEET #2

I. Lubricate glove

(NOTE: K-Y jelly is the best lubricant to use, but mild soap will work.)

J. Insert left hand into rectum for removal of feces

K. Clean exterior of the vulva with paper towel

L. Locate cervix with left hand in rectum and hold in palm of hand

(NOTE: If cow is straining to expel your arm, relax a minute and the cow will also relax.)

M. Insert tube into the vulva with right hand; locate cervical guide tube opening and gently insert through the three rings of the cervix

(NOTE: Tube should be inserted at a slight upward incline to reduce chance of entering urethra.)

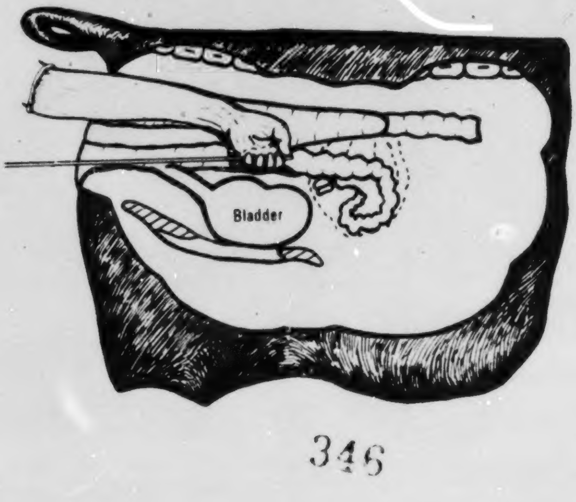
N. Deposit semen at the end of the cervix by pressing the polybulb between the thumb and finger of the right hand; squeeze slowly

O. Remove tube from vagina; remove hand from rectum

P. Locate and squeeze clitoris between thumb and finger

(NOTE: This assists in improved conception rate. The cervix in a heifer will be soft and pliable, while in older cows it will feel hard and rigid like a baseball.)

III. Diagram of procedure



ARTIFICIAL INSEMINATION
UNIT III

TEST

NAME ______________________________ SCORE ______________

1. Match the terms on the right to the correct definitions.

_____a. Internal body secretion that aids in reproduction

_____b. Length of time from fertilization until birth

_____c. Means of obtaining pregnancy without the use of natural service

_____d. Uniting of the female and male germ cells

_____e. Term used to indicate that an animal is carrying a young fetus

_____f. Female and male germ cells meeting and fertilization occurring without future heat cycles

_____g. Tube used to place sperm into a female's reproductive tract

_____h. Time elapsing from one heat period to the next

1. Inseminating tube
2. Hormone
3. Pregnancy
4. Artificial insemination
5. Fertilization
6. Gestation
7. Conception
8. Estrus cycle

2. Select from the following list the advantages of using artificial insemination by placing an "X" in the spaces provided.

_____a. Higher cost of keeping sire

_____b. Wider selection of sires

_____c. Improvement of herd

_____d. Increased spread of disease

_____e. Increase in offspring uniformity

_____f. Reduced cost of keeping sire

3. Select from the following list the disadvantages of artificial insemination by placing an "X" in the spaces provided.

_____a. Less time required

_____b. More equipment needed

_____c. Skilled technician required

4. Name two sources of semen for use in artificial insemination.

a. ____________________

b. ____________________

5. List the following characteristics of semen.

a. Color--____________________

b. Volume--____________________

c. pH--____________________

d. Sperm cell concentration--____________________

6. Select from the following list the factors that influence volume of semen produced by placing an "X" in the spaces provided.

_____a. Health

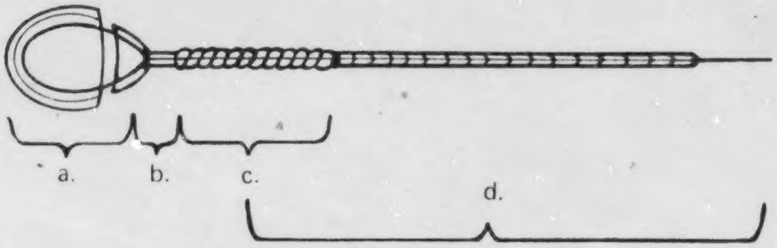
_____b. Size

_____c. Age of female

_____d. Frequency of collection

_____e. Weight

7. Identify the parts of the sperm cell.



a. ____________________ c. ____________________

b. ____________________ d. ____________________

8. Name three types of abnormal sperm.

a. ______________________________

b. ______________________________

c. ______________________________

9. Discuss the signs of estrus in cows.

____

____

____

____

____

____

10. State which sign of estrus is the most important in regard to time of insemination.

____

____

11. Match the farm animals on the right to the normal estrus cycle.

_____a. 19-23 days	1. Cow
_____b. 18-24 days	2. Mare
_____c. 16-24 days	3. Sow

12. Name the time when a cow ovulates.

____

13. Select from the following list factors that contribute to poor conception rates by placing an "X" in the spaces provided.

_____a. Improper timing

_____b. Disease

_____c. Good insemination technique

_____d. Management failure

_____e. Ovulation failure

14. Select from the following list the reasons why timing is important when using artificial insemination.

_____a. Sperm must be in the Fallopian tube six hours before ovulation occurs

_____b. No sperm is produced if cow is inseminated too early

_____c. Cervical reaction or uterine contraction must be present

15. Match the animals on the right to the correct gestation periods.

_____a. 150 days	1. Cow
_____b. 283 days	2. Sow
_____c. 114 days	3. Ewe
_____d. 336 days	4. Mare

16. Match the percentage of pregnancies expected when using artificial insemination on the left with the number of services on the right by placing the correct response in the space provided.

_____a. First service	1. 85% to 95%
_____b. Second service	2. 70% to 85%
_____c. Third service	3. 65% to 70%

17. Select from the following list functions of the ovary by placing an "X" in the spaces provided.

_____a. Produces the egg

_____b. Produces hormone progesterone

_____c. Starts cow to produce milk

_____d. Builds nest for embryo

_____e. Produces hormone estrogen

18. Name two functions of the mucous fluid.

a. ______________________________

b. ______________________________

19. Name four reasons why cattle do not settle.

a. ____

b. ____

c. ____

d. ____

20. Match the methods of thawing semen on the right to the correct procedures by placing the correct number in the blank provided.

_____a. Place in water bath at 37°F for 8 to 10 minutes

_____b. Place in water bath at 37°F for 10 minutes

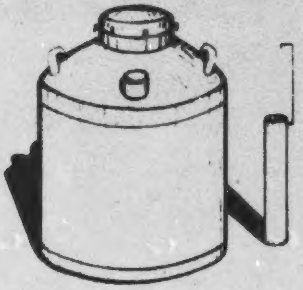
_____c. Place in water bath at 90° to 95°F for one minute

_____d. Take straight from nitrogen tank without thawing and inseminate

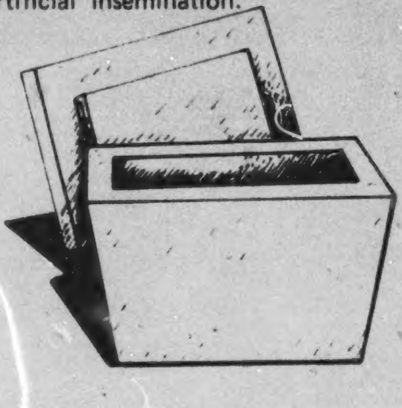
_____e. Place in water bath at 110°F for 40 seconds

1. Hot bath (straw)
2. No-thaw (straw)
3. Hot bath (ampule)
4. Ice bath (straw)
5. Ice bath (ampule)

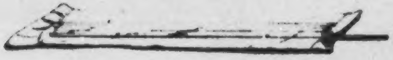
21. Identify the following equipment necessary for artificial insemination.



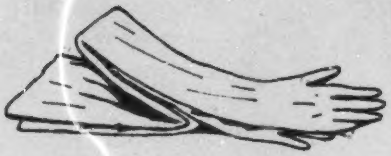
a. ______________________



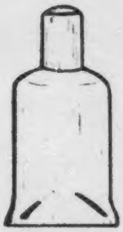
b. ______________________



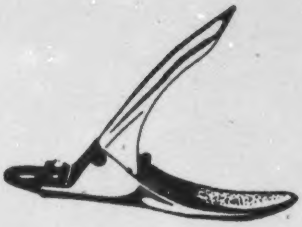
c. ______________________



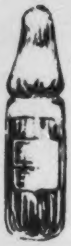
d. ______________________



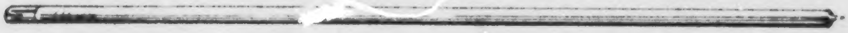
e. ______________



f. ______________

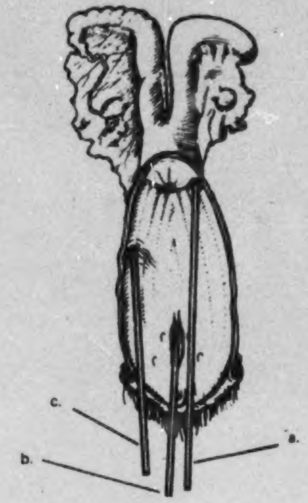


g. ______________



h. ______________________

22. Identify the three common errors in inseminating a cow with relationship to the misplacement of the inseminating tube.



a. ______________________________

b. ______________________________

c. ______________________________

23. Examine semen for mobility and abnormalities.

24. Identify points in time on an estrus cycle chart.

25. Demonstrate the ability to:

   a. Place inseminating tube and dye into reproductive tract acquired from slaughterhouse.

   b. Inseminate a cow.

   (NOTE: If activities 23-25 have not been accomplished prior to the test, ask your instructor when they should be completed.)

ARTIFICIAL INSEMINATION
UNIT III

ANSWERS TO TEST

1. a. 2
   b. 6
   c. 4
   d. 5
   e. 3
   f. 7
   g. 1
   h. 8
2. b, c, e, f
3. b, c
4. Any two of the following:
   a. Studs
   b. Collecting own sire
   c. Buying direct from breeder
5. a. Color--White to cream, with variations from clear to yellow
   b. Volume--From 2 to 6 cubic centimeters
   c. pH--Range of 6.5 to 6.9
   d. Sperm cell concentration--Considerable variations among males
6. a, b, d
7. a. Head
   b. Neck
   c. Middle piece
   d. Tail

8. Any three of the following:
   a. Tailless head
   b. Two heads
   c. Two tails
   d. Pear-shaped head
9. Discussion should include:
   a. Standing to be ridden
   b. Riding others
   c. Nervousness; restlessness
   d. Clear, sticky mucus flowing from vulva
   e. Minor indications
      1) Dirt or mud on flanks or back
      2) Hair standing up on tail head
      3) Bellowing
      4) Holding up milk
10. Standing to be ridden
11. a. 3
    b. 1
    c. 2
12. 8 to 10 hours after standing heat
13. a, b, d, e
14. a, c
15. a. 3
    b. 1
    c. 2
    d. 4
16. a. 3
    b. 2
    c. 1

17. a, b, d, e
18. a. Serves as cleansing agent
    b. Serves as stream for passage of sperm
19. a. Ovulation failure
    b. Delayed ovulation
    c. Failure of follicle to rupture
    d. Stimulant not moving sperm
20. a. 4
    b. 5
    c. 1
    d. 2
    e. 3
21. a. Nitrogen chest
    b. Thaw box
    c. Inseminating tubes
    d. Disposable glove
    e. Polybulb
    f. Straw clippers
    g. Ampule
    h. Straw
22. a. Tube placed in blind cavity of cervix
    b. Tube placed in urethra opening
    c. Tube placed in fold of vaginal wall
23. Evaluated to satisfaction of instructor
24. Evaluated to satisfaction of instructor
25. Performance skills evaluated to satisfaction of instructor

FERTILITY AND PREGNANCY TESTING
UNIT IV

UNIT OBJECTIVE

After completion of this unit, the student should be able to recognize the advantages of fertility and pregnancy testing of cattle and apply them to student's own farming or ranching operations. The student should be able to demonstrate the ability to pregnancy test cows. This knowledge will be evidenced by completion of job sheet and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with fertility and pregnancy testing to the correct definitions.
2. Select from a list advantages of pregnancy testing.
3. Select from a list advantages of fertility testing bulls.
4. Identify the parts of a cow's reproductive tract.
5. Name the distinct indications of pregnancy while using a rectal examination.
6. Identify the stages of pregnancy when given a reproductive tract or an artist's drawing showing the stages.
7. State in writing the most difficult stage of pregnancy to detect when using the rectal examination.
8. Discuss in a short paragraph why the left hand and arm should be used in rectal examinations of cows for pregnancy.
9. Select from a list causes of sterility and delayed breeding in bulls.
10. Match grades of semen to visual characteristics.
11. Select from a list periods during the year that represent the most practical time for checking bulls for fertility.
12. Demonstrate the ability to pregnancy test a cow by using the rectal examination.

FERTILITY AND PREGNANCY TESTING
UNIT IV

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

   A. Provide student with objective sheet.

   B. Provide student with information and job sheets.

   C. Make transparencies.

   D. Discuss unit and specific objectives.

   E. Discuss information sheet.

   F. Arrange with veterinarian to allow student an opportunity to see a bull being fertility tested.

   G. Secure pregnant reproductive tracts from slaughterhouse showing the different stages of pregnancy.

   H. Arrange with slaughterhouse to use cattle before slaughter to check for pregnancy.

   I. Have student bring in a cow to pregnancy test.

   J. Have student follow job sheet when doing pregnancy test on a cow.

   K. Pregnancy test mares and sows.

   (NOTE: To pregnancy test mares, perform a rectal examination, blood serum test, urine test, or male toad test. Check with local veterinarian as to best method. Due to the size of the sow's reproductive tract, a rectal examination is impossible. However, electronic devices have been developed, such as the "Scanopreg" pregnancy tester from Ithaca, Inc., Ithaca, N.Y.)

   L. Give test.

   M. Reteach if necessary.

II. Instructional materials:

   A. Objective sheet

   B. Information sheet

C. Transparency masters

1. TM 1--Parts of Reproductive Tract Positioned Within Cow's Body
2. TM 2--Stages of Pregnancy

D. Job Sheet #1--Pregnancy Test a Cow Using Rectal Examination

E. Test

F. Answers to test

III. Unit references:

A. Ensminger, M. Eugene. *Animal Science.* Danville, Illinois: The Interstate Printers and Publishers, Inc., 1965.

B. Ensminger, M. Eugene. *Beef Cattle Science.* Danville, Illinois: The Interstate Printers and Publishers, Inc., 1968.

C. Hafez, E. S. E., ed. *Reproduction in Farm Animals.* Philadelphia: Lea and Febiger Publishers, Inc., 1962.

FERTILITY AND PREGNANCY TESTING
UNIT IV

INFORMATION SHEET

I. Terms and definitions

A. Sterility--Temporary or permanent inability to reproduce

B. Conception--Female and male germ cells meeting and fertilization occurring without future heat cycles

C. Estrus cycle--Time elapsing from one heat period to the next

D. Palpation--Examination by touching

E. Fetus--Young of an animal in the uterus

F. Fertility testing--Method for evaluating the breeding soundness of bulls; method for detecting infertility

G. Pregnancy--Term used to indicate that an animal is carrying a young fetus

II. Advantages of pregnancy testing

A. Cuts winter feed bills

B. Identifies pregnant cows

C. Provides means of culling cows from herd

D. Increases profit

Example: Setting goal of 90% to 95% calf crop within 30 days

(NOTE: Slaughter cows will bring a higher return if known to be open. Purebred animals will bring more money if known to be safely with calf.)

III. Advantages of fertility testing bulls

A. Prevents loss of calf crop

B. Increases calf crop

C. Provides means of selecting bulls

D. Provides means of culling bulls from herd

INFORMATION SHEET

- E. Shortens calving season
- F. Increases profit

IV. Parts of cow's reproductive tract (Transparency 1)

- A. Rectum
- B. Bladder
- C. Body cavity
- D. Uterus
- E. Cervix
- F. Vagina
- G. Cotyledons
- H. Pelvic girdle
- I. Brim of pelvic
- J. Vulva

V. Indications of pregnancy

- A. Palpation of fetus
- B. Presence of fluid in uterine horn

  (NOTE: The uterine horn changes in shape and size during different stages of pregnancy.)
- C. Presence and size of cotyledons
- D. Diameter and pulse rate of uterine artery
- E. Location of uterus to the relationship of pelvic floor

INFORMATION SHEET

VI. Stages of pregnancy (Transparency 2)

(NOTE: The stage of pregnancy can be estimated by squaring the month of gestation and dividing by two.)

Example: Cow has been bred 4 months
4 x 4 = 16 ÷ 2 = 8
Fetus should be 8 inches long

A. 30 - 45 days

(NOTE: Fetus is the size of a thumb.)

B. 80 - 100 days

(NOTE: Fetus is positioned on pelvic floor. The uterine horn is usually the size of a boxing glove.)

C. 120 - 150 days

(NOTE: The legs of the fetus are distinguishable. Less fluid is present in the uterine horn. The uterine horn membrane seems to be thicker at this stage.)

D. 160 - 180 days

(NOTE: This is the hardest month to detect because the calf is pulled over the pelvic girdle and positioned on the floor of the body cavity.)

E. 210 - 240 days

(NOTE: This is an easy stage to detect. The calf is positioning itself for calving.)

VII. Rectal examination of pregnancy most difficult--During the 160 - 180 days of pregnancy because the calf is pulled over the brim of the pelvic girdle

VIII. Reasons for using left hand and arm for rectal examinations of cows

A. Most pregnancies occur on right side

(NOTE: Research shows that most pregnancies occur on the right side in mares also.)

B. Body is positioned in such a manner that the left arm has a tendency to move to the right side of the cow

INFORMATION SHEET

IX. Causes of sterility and delayed breeding in bulls

- A. Poor semen
- B. Physical defects and injuries
- C. Psychological
- D. Infection and disease
- E. Poor management and feeding
- F. Inherited abnormalities

X. Grades of semen

A. Satisfactory--Semen that has a good density indicated by a milky white ejaculate

(NOTE: The bull would be capable of settling most cows.)

B. Questionable--Semen that has a single or combination of low values for density, mobility, and rate of movement

(NOTE: The bull is not sterile but will only settle about one-fourth to one-half of the cows.)

C. Cull--Semen that has a watery color

(NOTE: Bulls that produce cull semen should be disposed of or treated as soon as possible.)

XI. When to check for fertility

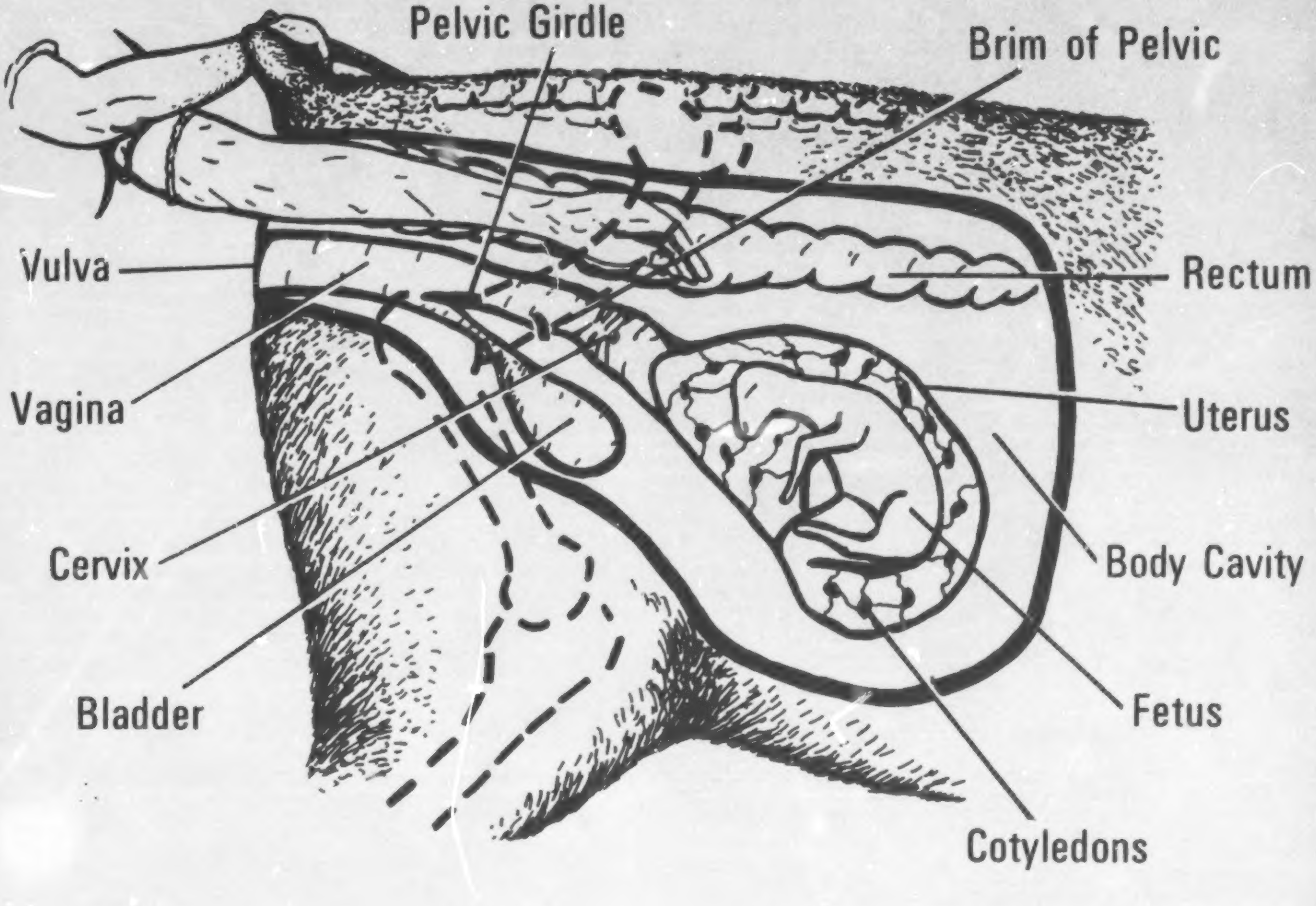
A. Just before breeding season

(NOTE: By testing at this time, you can identify sterile or near-sterile bulls at the time they are expected to settle cows.)

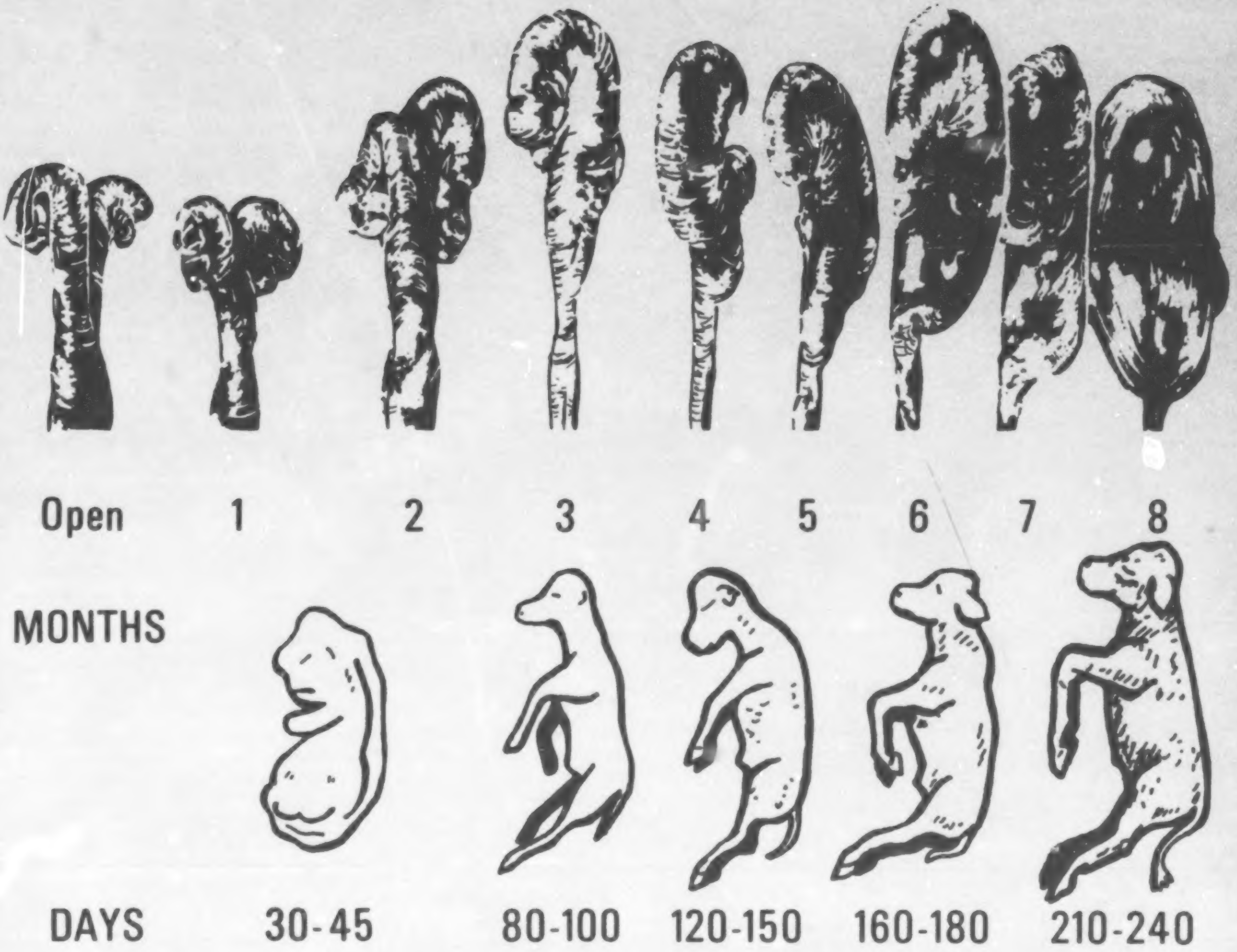
B. Soon after breeding season

(NOTE: Semen collected at the end of the breeding season should be evaluated carefully because heavy service temporarily lowers the semen quality in most bulls.)

Parts of Reproductive Tract Positioned Within Cow's Body



Stages of Pregnancy



FERTILITY AND PREGNANCY TESTING
UNIT IV

JOB SHEET #1--PREGNANCY TEST A COW USING RECTAL EXAMINATION

I. Tools and equipment

A. Chute

B. Plastic gloves

C. Lubricant

D. Cow showing indications of pregnancy

II. Procedure

A. Place cow in chute

B. Place plastic glove on left hand

(NOTE: Be sure to remove any jewelry that you might be wearing. If you are left-handed, place the glove on your right hand.)

C. Wet plastic glove with water and apply lubricant

D. Grasp the cow's tail with right hand and move the tail to the left side of the cow

E. Insert left hand and arm into the cow's rectum to a depth of approximately six inches

(CAUTION: This should be done carefully to prevent damage to the cow or the fetus.)

F. Remove feces as necessary in order to be able to palpate with fingers

G. Locate the cervix and position in hand in the same manner as in artificial insemination

H. Notice position of cervix in relation to pelvic cavity

(NOTE: If cervix is not found on pelvic floor at an approximate depth of six inches, it is a good indication that the cow could be pregnant. If this is the case, while holding the cervix in the hand, attempt to pull the cervix back up on the floor of the pelvic girdle for easier palpation.)

I. Move hand slowly down the tract to the separation of the uterus where the two uterine horns lead off, without turning loose of reproductive tract

JOB SHEET #1

J. Palpate each horn in order to determine if one horn is larger than the other

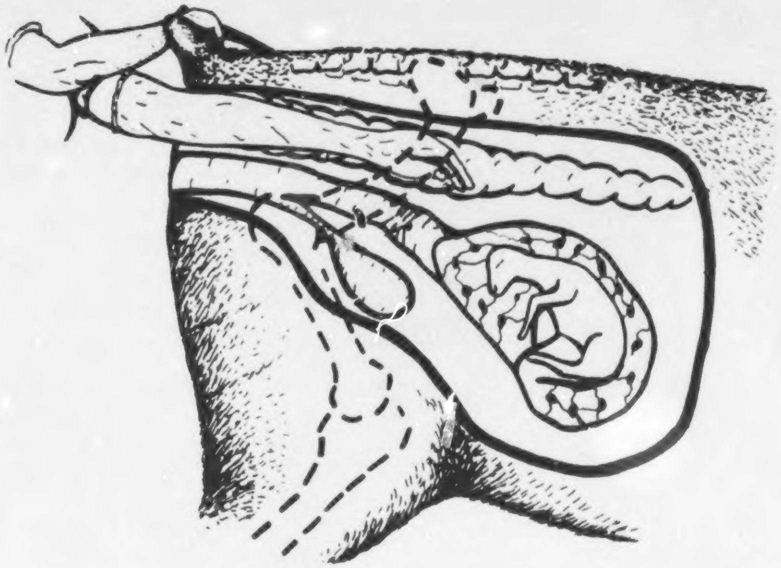
(NOTE: Remember, do not turn loose of the tract because you might forget which horn you are palpating.)

(CAUTION: Do not squeeze the horns; simply rub or palpate each one.)

K. Rely on the different stages and indications of pregnancy and determine if the cow you are examining is pregnant

L. Reveal your findings to the instructor for evaluation

III. Diagram of procedure



FERTILITY AND PREGNANCY TESTING
UNIT IV

TEST

NAME ______________________________ SCORE ____________

1. Match the terms on the right to the correct definitions.

______a. Method for evaluating the breeding soundness of bulls; method for detecting infertility

______b. Temporary or permanent inability to reproduce

______c. Term used to indicate that an animal is carrying a young fetus

______d. Examination by touching

______e. Young of an animal in the uterus

______f. Time elapsing from one heat period to the next

______g. Female and male germ cells meeting and fertilization occurring without future heat cycles

1. Sterility
2. Conception
3. Estrus cycle
4. Palpation
5. Fetus
6. Fertility testing
7. Pregnancy

2. Select from the following list advantages of pregnancy testing by placing an "X" in the spaces provided.

______a. Increases winter feed bills

______b. Identifies pregnant cows

______c. Provides means of culling cows from herd

______d. Increases variances in calving time

______e. Cuts winter feed bills

______f. Increases profit

3. Select from the following list advantages of fertility testing bulls by placing an "X" in the spaces provided.

______a. Provides means of selecting bulls

______b. Decreases calf crop

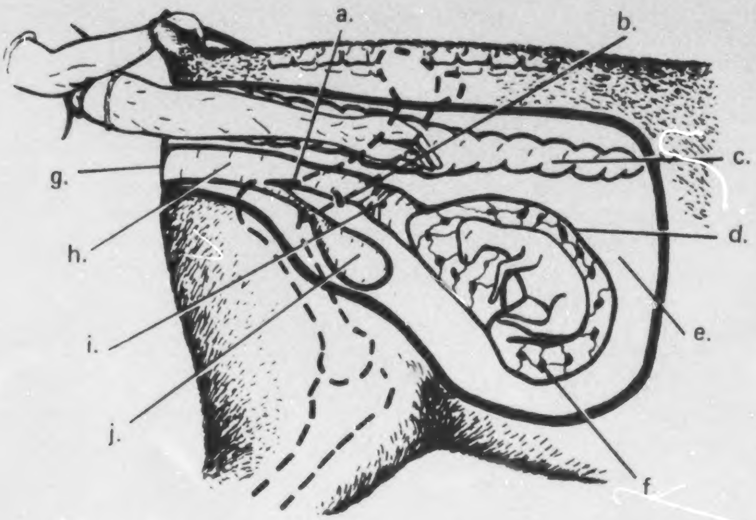
______c. Increases calving season

______d. Increases profit

______e. Prevents loss of calf crop

______f. Provides means of culling bulls from herd

4. Identify the following parts of the cow's reproductive tract.



a. ______________________ f. ______________________

b. ______________________ g. ______________________

c. ______________________ h. ______________________

d. ______________________ i. ______________________

e. ______________________ j. ______________________

5. Name the five distinct indications of pregnancy while using the rectal examination.

a. ______________________________

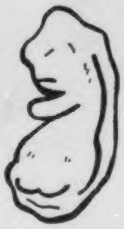
b. ______________________________

c. ______________________________

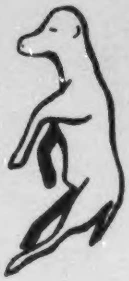
d. ______________________________

e. ______________________________

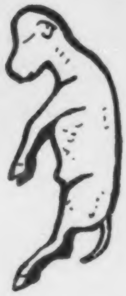
6. Identify the following stages of pregnancy by writing the range in days in the blanks provided.



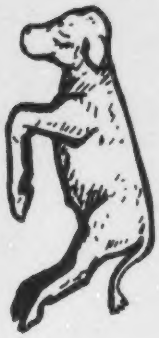
a. ____________________



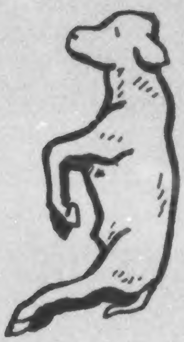
b. ____________________



c. ____________________



d. ____________________



e. ______________________________

7. State the most difficult stage of pregnancy to detect when using the rectal examination.

____

____

____

8. Discuss in a short paragraph why the left arm and hand should be used in rectal examinations of cows for pregnancy.

____

____

____

____

____

9. Select from the following list the causes of sterility and delayed breeding in bulls by placing an "X" in the spaces provided.

_____a. Psychological

_____b. Good semen

_____c. Physical defects and injuries

_____d. Good management and feeding

_____e. Inherited abnormalities

_____f. Infection and disease

10. Match grades of semen on the right to the correct visual characteristics by placing the correct answers in the spaces provided.

_____a. Semen that has a single or combination of low values for density, mobility, and rate of movement	1. Satisfactory
	2. Questionable
_____b. Semen that has a watery color	3. Cull
_____c. Semen that has a good density indicated by a milky white ejaculate	

11. Select from the following list the periods during the year that represent the most practical time for checking bulls for fertility.

_____a. Just before breeding season

_____b. Six to eight months before breeding season

_____c. Soon after breeding season

12. Demonstrate the ability to pregnancy test a cow by using the rectal examination.

(NOTE: If this activity has not been accomplished prior to the test, ask instructor when it should be completed.)

FERTILITY AND PREGNANCY TESTING
UNIT IV

ANSWERS TO TEST

1. a. 6
   b. 1
   c. 7
   d. 4
   e. 5
   f. 3
   g. 2
2. b, c, e, f
3. a, d, e, f
4. a. Pelvic girdle
   b. Brim of pelvic
   c. Rectum
   d. Uterus
   e. Body cavity
   f. Cotyledons
   g. Vulva
   h. Vagina
   i. Cervix
   j. Bladder
5. a. Palpation of fetus
   b. Presence of fluid in uterine horn
   c. Presence and size of cotyledons
   d. Diameter and pulse rate of uterine artery
   e. Location of uterus to the relationship of pelvic floor

6. a. 30 - 45 days

   b. 80 - 100 days

   c. 120 - 150 days

   d. 210 - 240 days

   e. 160 - 180 days

7. During the 160 - 180 days of pregnancy because the calf is pulled over the brim of the pelvic girdle

8. Discussion should include:

   a. Most pregnancies occur on right side

   b. Body is positioned in such a manner that the left arm has a tendency to move to the right side of the cow

9. a, c, e, f

10. a. 2

    b. 3

    c. 1

11. a, c

12. Performance skills evaluated to satisfaction of instructor

MARKET GRADES AND CLASSES OF LIVESTOCK
UNIT V

UNIT OBJECTIVE

After completion of this unit, the student should be able to identify the different grades and classes of cattle, swine, and sheep and classify them according to age, weight, and grade. The student should be able to place feeder and slaughter grades on live animals. This knowledge will be evidenced by completion of assignment sheets and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with market grades and classes of livestock to the correct definitions.
2. List factors that determine market classes of cattle.
3. Select from a list factors that should be considered in selecting feeder cattle.
4. Name the classes of cattle according to sex.
5. Match approximate age ranges for cattle to the correct definitions.
6. Select from a list indicators of yield grades.
7. List factors which are used in preliminary yield grade schedule.
8. Calculate yield grades for cattle carcasses.
9. Identify slaughter grades of cattle.
10. Identify the feeder grades of cattle.
11. Select from a list factors that determine market classes of sheep.
12. Name the classes of sheep according to sex.
13. Match age groups of sheep to the correct definitions.
14. Identify the market grades of slaughter lambs.
15. Select from a list factors that determine market classes of swine.

16. Name the classes of swine according to sex.
17. Identify the slaughter grades of swine.
18. Identify the feeder grades of swine.
19. Classify live cattle according to slaughter and feeder grades.
20. Classify swine according to slaughter grades.

MARKET GRADES AND CLASSES OF LIVESTOCK
UNIT V

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

   A. Provide student with objective sheet.

   B. Provide student with information sheet.

   C. Discuss unit and specific objectives.

   D. Discuss information and assignment sheets.

   E. Take students to state swine field day for swine grading.

   F. Arrange for student to participate in the state cattle grading contest.

   G. Have student evaluate live animals and carcasses on the rail as to possible yield grade.

   H. Arrange field trip to allow student the opportunity to practice identifying slaughter, yield, and feeder grades of cattle, swine, and sheep.

   I. Give test.

   J. Reteach if necessary.

II. Instructional materials:

   A. Objective sheet

   B. Information sheet

   C. Assignment sheets

      1. Assignment Sheet #1--Calculate Yield Grades

      2. Assignment Sheet #2--Classify Live Cattle According to Slaughter and Feeder Grades

      3. Assignment Sheet #3--Classify Swine According to Slaughter Grades

   D. Answers to assignment sheets

   E. Test

   F. Answers to test

III. Unit references:

A. Ensminger, M. Eugene. *Animal Science*. Danville, Illinois: The Interstate Printers and Publishers, Inc., 1965.

B. Kimbrell, Eddie F., and Daugherty, R. E. "U.S. Grades for Feeder Cattle." *OSU Extension Facts*, no. 417. Stillwater: Oklahoma State University, n.d.

C. Kimbrell, Eddie F., and Daugherty, R. E. "U.S. Slaughter Cattle Grades - Quality and Yield." *OSU Extension Facts*, no. 416. Stillwater: Oklahoma State University, n.d.

D. *USDA Yield Grades for Beef*. Washington, D.C.: United States Department of Agriculture/Consumer and Marketing Service, n.d.

E. *USDA Grades for Slaughter Swine and Feeder Pigs*. Washington, D.C.: United States Department of Agriculture/Consumer and Marketing Service, n.d.

F. *USDA Yield Grades for Lambs*. Washington, D.C.: United States Department of Agriculture/Consumer and Marketing Service, n.d.

MARKET GRADES AND CLASSES OF LIVESTOCK
UNIT V

INFORMATION SHEET

I. Terms and definitions

A. Slaughter animal--Animal that is intended for immediate slaughter or that is more suitable for slaughter than for any other purpose

B. Grade of livestock--Relative degree of excellence; final subdivision in a classification for marketing any kind of livestock

C. Class of livestock--Grouping of livestock according to the purpose for which an animal is to be used

D. Feeder animal--Animal that is intended for intensive feeding in preparation for slaughter

E. Stocker animal--Animal that is intended for further growth for pasturing and rough feeding

F. Milker or springer--Cow recently freshened or soon due to calve, which is sold for milking purposes

G. Slaughter calf--Calf between the ages of three months and one year which usually received grain in addition to milk and is fat enough for slaughter

H. Feeder calf--Calf which is of weaning age and is sold to go back into the country for further growing or finishing

I. Slaughter sheep--Yearling or older animal intended for immediate slaughter

J. Feeder sheep--Yearling or older animal best suited for further finishing

K. Slaughter lamb--Young lamb under one year of age that is fat enough for immediate slaughter

L. Feeder lamb--Young lamb under one year of age that carries sufficient finish for slaughter purposes but which shows indications of making good gains if placed on feed

M. Shearer lamb--Lamb intended for shearing and further finishing prior to slaughtering

N. Yield grade--Amount of lean meat

INFORMATION SHEET

II. Factors determining market classes of cattle

   A. Sex

   B. Age

   C. Weight

III. Factors to consider in selecting feeder cattle

   A. Use

   B. Sex

   C. Age

   D. Thrift

   E. Natural fleshing

   F. Breeding

   G. Uniformity

   H. Absence of horns

   I. Temperament and disposition

IV. Classes of cattle according to sex

   A. Steer

   B. Heifer

   C. Cow

   D. Bull

   E. Stag

V. Age ranges of cattle

   A. Vealers--Cattle under three months of age

   B. Calves--Young cattle between the vealer and yearling stage

   C. Yearlings--Cattle from 12 to 24 months of age

   D. Two-year-olds--Cattle from 24 to 36 months of age

   E. Older cattle--Cattle that are over 36 months of age

INFORMATION SHEET

VI. Indicators of yield grades

A. Amount of external fat

B. Size of ribeye muscle

C. Quantity of kidney, pelvic, and heart fat

D. Carcass weight

VII. Preliminary yield grade schedule

A. Fat thickness over rib eye (PYG) Preliminary yield grade

Fat thickness over rib eye		(PYG) Preliminary yield grade
0.0 inches	=	2.0
0.2 inches	=	2.5
0.4 inches	=	3.0
0.6 inches	=	3.5
0.8 inches	=	4.0
1.0 inches	=	4.5

(NOTE: *Quality grade* refers to the quality of the meat. *Yield grade* refers to the amount of lean meat.)

B. Carcass weight

1. 600 pounds is standard carcass
2. For each 25 lbs under 600 lbs, subtract 0.1 from PYG
3. For each 25 lbs over 600 lbs, add 0.1 to the PYG

C. Rib eye

1. 11 square inches is standard
2. For each square inch under 11 square inches, add 0.3 to PYG
3. For each square inch over 11 square inches, subtract 0.3 from PYG

D. Kidney fat

1. 3.5% is average kidney fat
2. For each 0.5% under 3.5, subtract 0.1 from PYG
3. For each 0.5% over 3.5, add 0.1 to PYG

INFORMATION SHEET

VIII. Yield grade formula (Assignment Sheet #1)

PYG ± carcass weight ± ribeye area ± kidney fat = Yield grade

Example: 600# carcass with a 0.2 fat thickness, 12 square inches of ribeye area, and 3.0% kidney fat

Fat thickness of 0.2 inches = PYG of 2.5

2.5 + 0 - 0.3 - 0.1 = 2.1 yield grade, 2 high

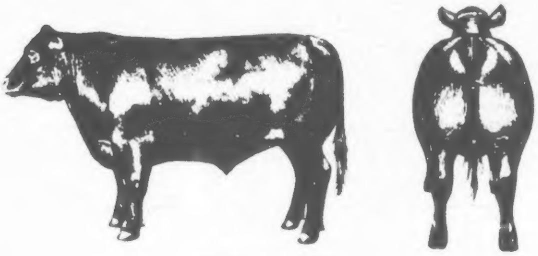
(NOTE: The five yield grades are 1, 2, 3, 4, and 5. The breakdown for high, average, and low is 0.00 to 0.33 as high, 0.34 to 0.66 as average, and 0.67 to 1.00 as low.)

Example: 1.55 = 1 average, 2.88 = 2 low

IX. Slaughter grades of cattle

A. Steers and heifers

1. Prime

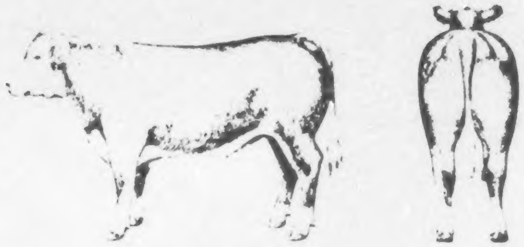


PRIME

(NOTE: Slaughter cattle possessing the minimum qualifications for the Prime grade are thick-fleshed animals that are wide over the back, loin, and rump. Looking at them from the rear you can see that they have thick, plump rounds. These cattle are relatively young animals with a moderately thick, smooth covering of fat over the back, ribs, loin, and rump. The animals are filled out well in the briskets and flanks. To be eligible, slaughter cattle must be approximately 42 months of age or younger.)

INFORMATION SHEET

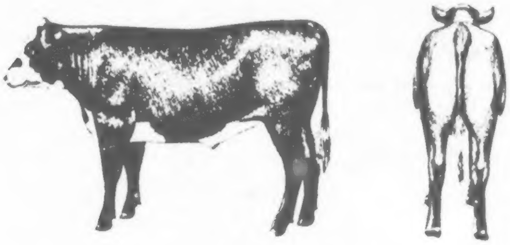
2. Choice



CHOICE

(NOTE: Slaughter cattle possessing minimum qualifications for the Choice grade are moderately thick muscled and tend to be moderately thick fleshed. They are moderately neat and smoothly laid in with only a slight tendency toward prominence in older cattle. The twist is moderately full and the rounds are moderately thick and plump. There is a fullness or bulge distinctly evident over the crops, loin, and rump. The cattle carry a slightly thick fat covering over the top. The brisket, flanks, and cod or udder appear moderately full.)

3. Good

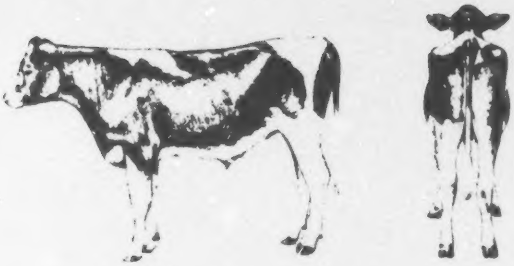


GOOD

(NOTE: Cattle possessing minimum qualifications for the Good grade are not as thick fleshed nor as wide and thick over the top as the Choice and Prime steers and heifers. They also lack thickness and plumpness in the rounds. They have a thin covering of outside fat, most of which is over the loin and ribs. In addition, the brisket, flanks, and cod or udder appear to be only slightly full.)

INFORMATION SHEET

4. Standard



STANDARD

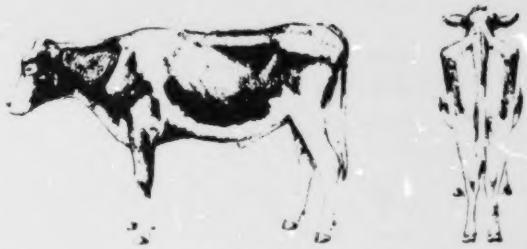
(NOTE: Slaughter cattle possessing minimum qualifications for the Standard grade tend to be thinly muscled, slightly rangy, and upstanding and tend to be thinly fleshed. They are narrow through the back and loin, somewhat prominent at the hips, and shallow in the twist and rounds. The loin, rump, and rounds appear flat with no evidence of fullness. They have only a very thin covering of outside fat. There is very little evidence of fullness in the brisket and flanks.)

5. Commercial

(NOTE: The Commercial grade is limited to cattle over approximately 48 months of age. Slaughter cattle possessing the minimum qualifications for Commercial grade tend to be thinly muscled, slightly rangy, and thinly fleshed. They appear deep through the forerib and moderately wide through the back and loin. The hips and shoulders are prominent and the rounds are thin and shallow with no apparent bulge or fullness. Slaughter cattle which slightly exceed the minimum maturity for the Commercial grade have a slightly thick fat covering over the back, ribs, loin, and rump. Very mature cattle usually have at least a moderately thick fat covering over the back, ribs, loin, and rump and considerable patchiness frequently is evident about the tailhead. The brisket, flanks, and cod or udder appear to be moderately full.)

INFORMATION SHEET

6. Utility



UTILITY

(NOTE: Cattle possessing the minimum qualifications for the Utility grade are thinly muscled and tend to be rangy, upstanding, and angular. They are narrow through the crops. The loin, rump, and rounds appear slightly sunken. Shoulders and hips are decidely prominent and the depth through the forerib is much greater than through the rear flank. The degree of finish required for the utility grade varies throughout the range of maturity permitted in this grade, from a very thin covering of fat for cattle under 30 months of age to a slightly thick fat covering, generally restricted to the back, loin, and rump, for the very mature cattle in this grade. In such mature cattle, the crops are slightly thin and the brisket, flanks, and cod or udder indicate very slight fullness.)

7. Cutter

(NOTE: Slaughter cattle possessing the minimum qualifications for the Cutter grade are very thinly muscled and tend to be decidely rangy, upstanding, and angular. The hips and shoulders are very prominent and the loins and rounds are very sunken. The degree of finish ranges from practically none in cattle under 30 months of age to very mature cattle which have only a very thin covering of fat.)

8. Canner

(NOTE: Canner grade cattle are those which are inferior to the minimum specified for the Cutter grade.)

B. Cows

1. Commercial

2. Utility

INFORMATION SHEET

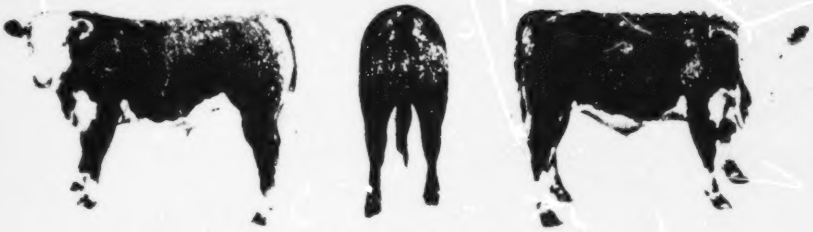
3. Cutter
4. Canner

C. Bulls and stags

1. Commercial
2. Utility
3. Cutter
4. Canner

X. Feeder grades of cattle

A. Prime



PRIME

(NOTE: Prime cattle which possess typical minimum qualifications for the Prime grade are extremely thrifty and are very large for their age, breed considered. They are wide through the chest with well-sprung ribs and are moderately wide and thick through the crops, back, and loin. The rounds tend to be thick and the twist is moderately deep. They usually have straight top and bottom lines and usually are moderately deep in the fore and rear flanks. The legs tend to be short, are set wide apart, and usually are straight. The head is usually short and wide and the neck usually is short and thick. They have large, rugged frames with moderately large but refined bone. They have a high degree of symmetry and smoothness throughout and usually show no evidence of nonbeef breeding. They have a logical slaughter potential of Prime. Only steers and heifers are eligible for the Prime grade.)

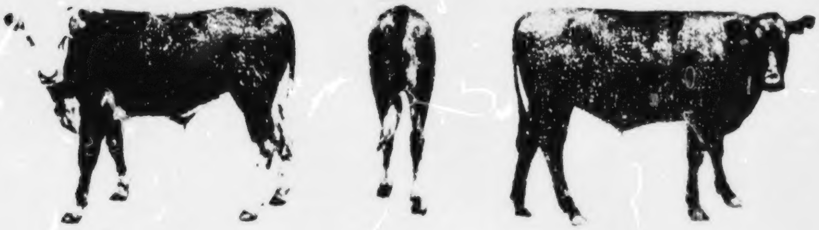
INFORMATION SHEET

B. Choice

CHOICE

(NOTE: Feeder cattle which possess typical minimum qualifications for the Choice grade are very thrifty and are large for their age, breed considered. They are thickly muscled throughout. They are moderately wide through the chest with a moderate spring of ribs and are slightly wide and thick through the crops, back, and loin. The rounds are slightly thick and the twist is slightly deep. They have straight top lines and are moderately deep in the fore and rear flanks. The legs are slightly short and are set moderately wide apart and are straight. The head is moderately short and wide and the neck is slightly short and thick. They have moderately large, rugged frames. The bone usually is moderately large, but may be slightly fine or slightly large and coarse. They have a moderate degree of symmetry and smoothness throughout and usually show a very high proportion of beef breeding. They have a logical slaughter potential of Choice.)

C. Good

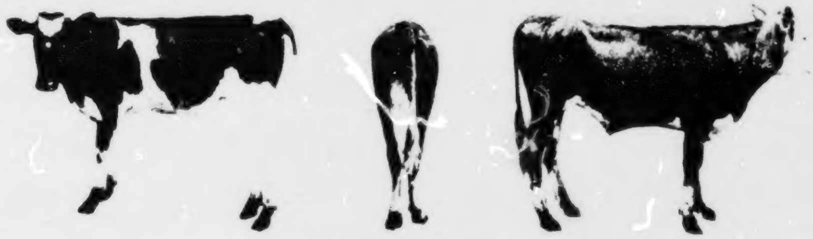


GOOD

INFORMATION SHEET

(NOTE: Feeder cattle which possess typical minimum qualifications for the Good grade are thrifty but may be slightly small for their age, breed considered. They are slightly thick muscled throughout. They are slightly narrow through the chest and may be slightly deficient in spring of rib. They are slightly narrow through the crops, back, and loin. The muscles of the rump are slightly sunken and the hips and shoulder joints are slightly prominent. The rounds are slightly thin, and the twist is slightly shallow. They usually have moderately straight top lines but may lack depth in the rear flank. The legs tend to be slightly long, are set slightly wide apart, and frequently are crooked. The head is usually slightly short and wide and the neck usually is slightly long and thin. They have a slightly large frame and the bone usually is slightly fine, although it may also be slightly large and coarse. They are slightly irregular and rough in appearance and usually are predominantly of beef breeding. They have a logical slaughter potential of Good.)

D. Standard

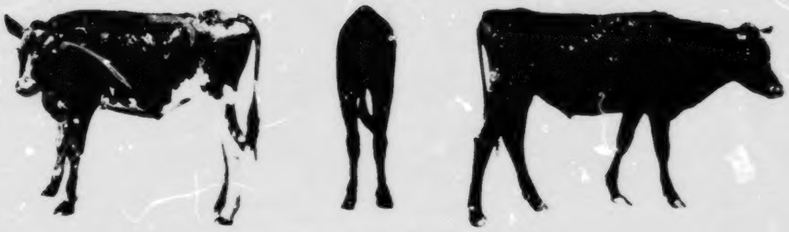


STANDARD

(NOTE: Feeder cattle which possess typical minimum qualifications for the Standard grade are only moderately thrifty and are moderately small for their age, breed considered. They are slightly thin muscled and are angular, rough, and irregular in appearance throughout. They tend to be narrow through the chest and through the crops, and the muscles of the back, loin, and rump tend to be slightly sunken. Hips and shoulder joints are prominent. The rounds are thin and slightly concave and the twist is shallow. They usually have an uneven top line and may lack depth in the rear flank. The legs are long, set close together, and are usually crooked. The head usually is long and narrow and the neck usually long and thin. They have a slightly small frame and the bone is usually moderately fine, although it also may be moderately large and coarse. They are usually predominantly of nonbeef breeding and have a logical slaughter potential of Standard.)

INFORMATION SHEET

E. Utility



UTILITY

(NOTE: Feeder cattle which possess typical minimum qualifications for the Utility grade are slightly unthrifty and are small for their age, breed considered. They are thinly muscled throughout and are very angular, rough, and irregular in appearance. They are very narrow through the chest and the crops and the muscles of the back, loin, and rump are sunken. Hips and shoulder joints are very prominent. The rounds are very thin and concave and the twist is very shallow. They usually have an irregular top line and are cut up in the rear flank. The legs are usually crooked. The head usually is very long and narrow and the neck usually is decidedly long and thin. They have a very small frame and the bone usually is very fine, although it also may be large and coarse. They usually have little or no evidence of beef breeding and have a logical slaughter potential of Utility.)

F. Inferior

(NOTE: Feeder cattle inferior to those described for Utility are graded Inferior.)

XI. Factors determining market classes of sheep

A. Sex

B. Age

C. Weight

XII. Classes of sheep according to sex

A. Ewe

B. Wether

C. Ram

INFORMATION SHEET

XIII. Age groups of sheep

A. Lambs

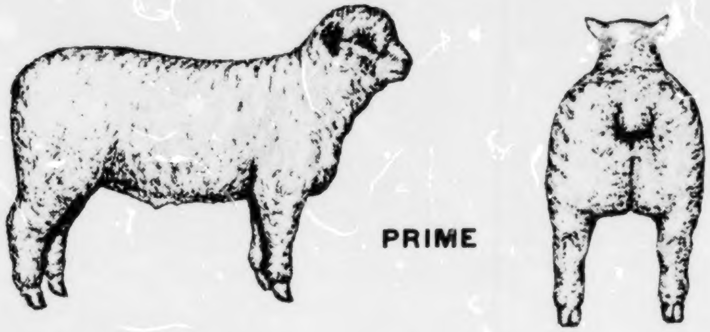
1. Hothouse- Lamb usually less than three months of age at slaughter which is born and marketed out of season
2. Spring--Lamb arriving at the market in the spring of the year and which ranges from three to seven months of age
3. Lamb--Young ovine animal that does not classify as either a hothouse or spring lamb

B. Sheep

1. Yearling--Young sheep between one and two years of age
2. Two-year-old--Sheep between 24 and 36 months old which has cut its second pair of permanent incisor teeth
3. Three-year-old--Sheep between 36 and 48 months old which has cut its third pair of permanent incisor teeth
4. Four-year-old--Sheep between 48 and 60 months old which has a full set of permanent incisors
5. Mature sheep--Animal two or more years old
6. Broken-mouthed--Sheep showing loss of teeth
7. Gummer--Sheep with all incisors missing or worn down to the gums
8. Spreader--Sheep with teeth which are long and spread apart on the surface

XIV. Market grades of slaughter lambs

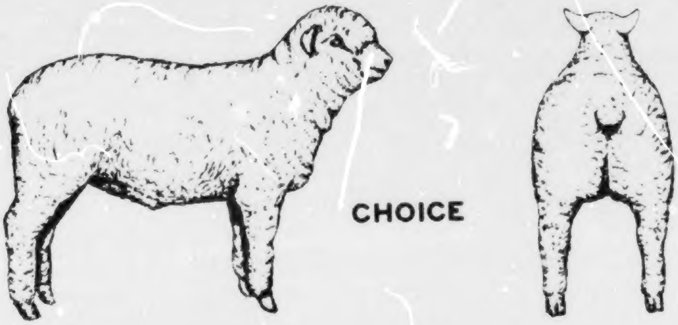
A. Prime



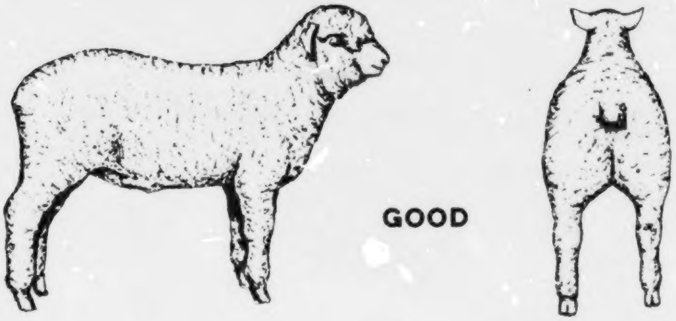
PRIME

INFORMATION SHEET

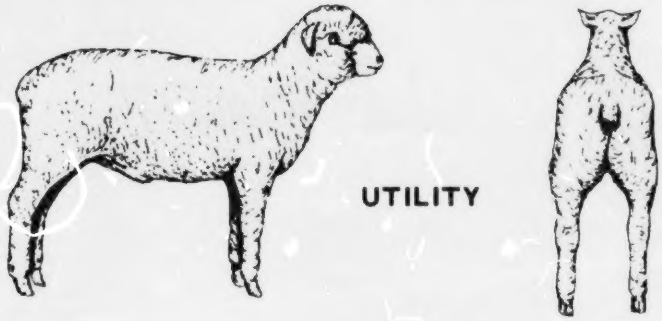
B. Choice



C. Good



D. Utility



(NOTE: The present on-foot quality grades of slaughter lambs was established in 1960. The grade of slaughter lamb is determined generally by conformation and quality; however, maturity and other factors are considered. Conformation includes the general body proportions and the ratio of meat to the bone, which are influenced by muscling and the animal's skeletal system.)

INFORMATION SHEET

XV. Factors determining market classes of swine

   A. Weight

      (NOTE: Animals under 120 pounds are generally known as *pigs*. Animals over 120 pounds are generally known as *hogs*.)

   B. Conformation

XVI. Classes of swine according to sex

   A. Boar

   B. Barrow

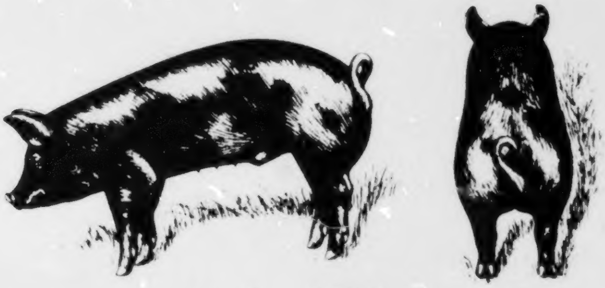
   C. Gilt

   D. Sow

   E. Stag

XVII. Slaughter grades of swine

   A. U.S. No. 1

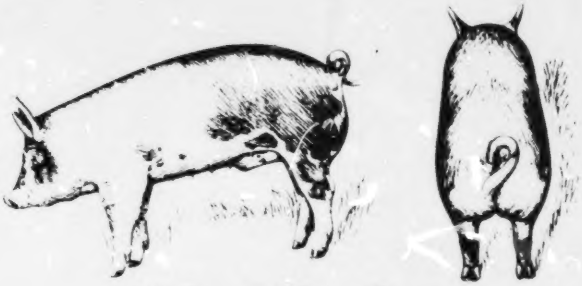


U.S. NO. 1

(NOTE: Barrows and gilts in this grade will produce carcasses with acceptable lean quality and acceptable belly thickness and a high percentage of lean cuts. Swine near the borderline between the U.S. No. 1 and U.S. No. 2 grades are thickly muscled in the hams, loins, and shoulders. The width through the ham is nearly equal to the width through the shoulders and both are wider than the back. The back is slightly full, is well-rounded, and blends smoothly into the sides. The sides are moderately long and smooth. The rear flank is slightly full and its depth is less than the depth of the fore flank. The jowls are firm and slightly thick and full.)

INFORMATION SHEET

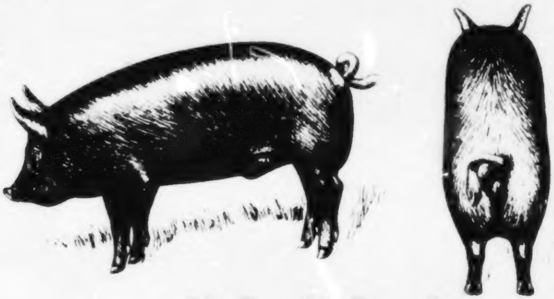
B. U.S. No. 2



U.S. NO. 2

(NOTE: Slaughter barrows and gilts in this grade will produce carcasses with acceptable lean quality, acceptable belly thickness, and a slightly high percentage of lean cuts. Swine near the borderline between the U.S. No. 2 and U.S. No. 3 grades are moderately thickly muscled in the hams, loins, and shoulders. The width through the shoulders is slightly more than the width through the hams. The back is moderately full and is slightly rounded but with a slight break into the sides. The sides are slightly short and smooth. The rear flank is moderately full and its depth is slightly less than the depth of the fore flank. The jowls are moderately thick and full.)

C. U.S. No. 3

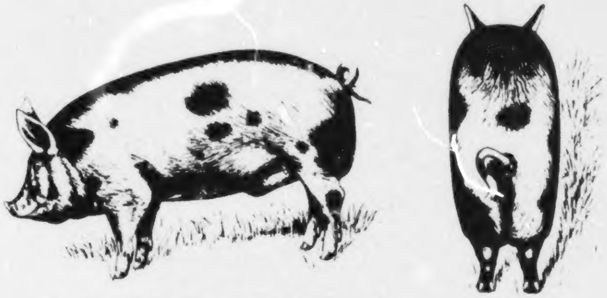


U.S. NO. 3

(NOTE: Slaughter barrows and gilts in this grade will produce carcasses with acceptable lean quality and acceptable belly thickness and a slightly low percentage of four lean cuts. Swine near the borderline between the U.S. No. 3 and U.S. No. 4 grades are slightly thin muscled in the hams, loins, and shoulders. The width through the shoulders is definitely greater than the width through the hams. The back is full and nearly flat with a pronounced break into the sides. The sides are short and smooth. The rear flank is full and its depth is equal to the depth of the fore flank. The jowls are thick and full.)

INFORMATION SHEET

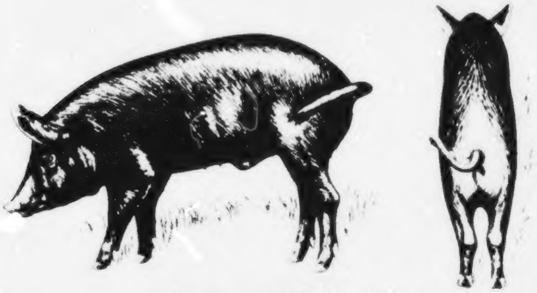
D. U.S. No. 4



U.S. NO. 4

(NOTE: Barrows and gilts in this grade will produce carcasses with acceptable lean quality and acceptable belly thickness. However, they are fatter and less muscular and will have a lower carcass yield of the four lean cuts than those in the U.S. No. 3 grade.)

E. U.S. Utility



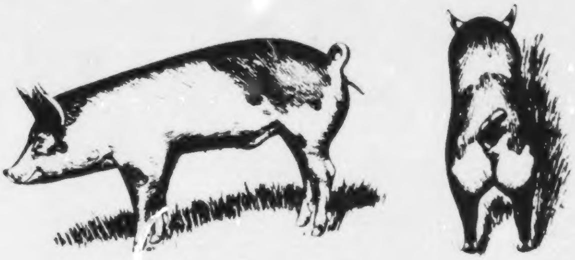
U.S. UTILITY

(NOTE: Barrows and gilts typical of this grade will have a thin covering of fat. The sides are wrinkled and the flanks are shallow and thin. Barrows and gilts in this grade will produce carcasses with unacceptable lean quality and/or unacceptable belly thickness.)

INFORMATION SHEET

XVIII. Feeder grades of swine

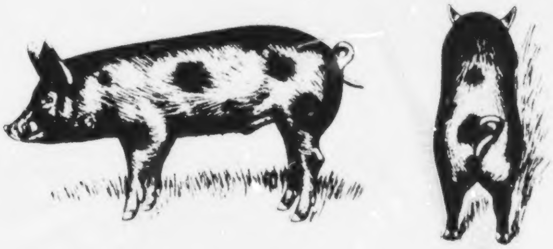
A. U.S. No. 1



U.S. NO. 1

(NOTE: Feeder pigs in this grade near the borderline of the U.S. No. 2 grade are long and have thick muscling throughout. Thickness of muscling is particularly evident in thick and full hams and shoulders. The hams and shoulders are thicker than the back, which is well-rounded. They usually present a well-balanced appearance. In no case may a feeder pig be graded U.S. No. 1 with less than moderately thick muscling. Feeder pigs in this grade are expected to produce U.S. No. 1 grade carcasses when slaughtered at 220 pounds.)

B. U.S. No. 2

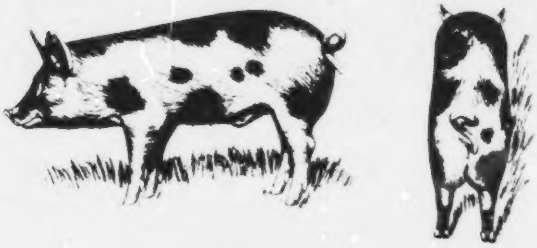


U.S. NO. 2

(NOTE: Feeder pigs in this grade near the borderline of the U.S. No. 3 grade are moderately long and have moderately thick muscling throughout. Thickness of muscling is particularly evident in moderately thick and full hams and shoulders. The back usually appears slightly full and well-rounded. They usually present a well-balanced appearance. This grade also includes feeder pigs which otherwise qualify for the U.S. No. 1 grade but have less than moderately thick muscling. Feeder pigs in this grade are expected to produce U.S. No. 2 grade carcasses when slaughtered at 220 pounds.)

INFORMATION SHEET

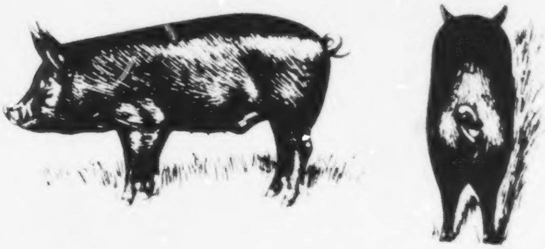
C. U.S. No. 3



U.S. NO. 3

(NOTE: Feeder pigs in this grade near the borderline of the U.S. No. 4 grade are slightly short and have slightly thin muscling throughout. The hams and shoulders are slightly thin and flat and the back usually appears moderately full and thick. Feeder pigs in this grade are expected to produce U.S. No. 3 grade carcasses when slaughtered at 220 pounds.)

D. U.S. No. 4

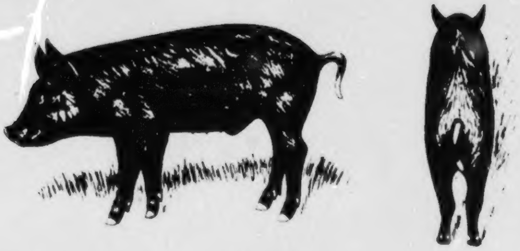


U.S. NO. 4

(NOTE: Feeder pigs typical of the U.S. No. 4 grade are short and have thin muscling throughout. The hams are thin and rather flat, particularly in the lower parts toward the shanks. The back usually appears slightly flat and the width at the topline usually is greater than at the underline. Feeder pigs in this grade are expected to produce U.S. No. 4 grade carcasses when slaughtered at 220 pounds.)

INFORMATION SHEET

E. U.S. Utility



U.S. UTILITY

(NOTE: Feeder pigs typical of this grade are small for their age and appear unthrifty. They often have a rough, unkempt appearance indicating the effects of disease or poor care. The hams and shoulders usually are thin and flat and taper toward the shanks. The back is thin and lacks fullness.)

MARKET GRADES AND CLASSES OF LIVESTOCK
UNIT V

ASSIGNMENT SHEET #1--CALCULATE YIELD GRADES

Work each of the following problems, using the formula for yield grades. When completed, turn in to the instructor for evaluation.

	Fat Thickness	Carcass Weight	Ribeye Area	Kidney Fat		Yield Grade
1.	0.1	625#	13 sq in	3.5	=	
2.	0.6	550#	11 sq in	4.5	=	
3.	0.3	600#	12 sq in	3.5	=	
4.	0.2	590#	10 sq in	3.0	=	
5.	0.8	750#	13.5 sq in	4.0	=	
6.	0.2	600#	11 sq in	3.5	=	

ASSIGNMENT SHEET #1

Market Classes and Grades of Cattle

Classes

- Slaughter Calf
- Slaughter Steer
- Slaughter Heifer
- Slaughter Cow
- Slaughter Bull
- Feeder Steer
- Feeder Heifer
- Bullock

Slaughter grades

Quality

% average dressing

60-67	Prime
57-63	Choice
56-60	Good
53-58	Standard
52-60	Commercial
47-55	Utility
43-52	Cutter
38-46	Canner

Yield

% boneless retail cuts from round, loin, rib and chuck in carcass

1	52.4-above
2	52.3-50.1
3	50.0-47.8
4	47.7-45.5
5	45.4-below

Feeder grades

- Prime
- Choice
- Good
- Standard
- Utility
- Inferior

Preliminary yield grade schedule

Thickness of fat over rib eye	Preliminary yield grade
0.0	2.0
0.2	2.5
0.4	3.0
0.6	3.5
0.8	4.0
1.0	4.5

Ribeye area needed for various carcass weights

Warm carcass weight	Area of rib eye square inches
500	9.8
525	10.1
550	10.4
575	10.7
600	11.0
625	11.3
650	11.6
675	11.9
700	12.2
725	12.5
750	12.8

Factors and change in each required to make full yield grade change

Factor	Effect on yield grade	Approximate change required to make full yield grade change
1. Thickness of fat over rib eye (increase)	Decreases	4/10 of 1 inch
2. Percent of kidney (increase)	Decreases	5%
3. Carcass weight (increase)	Decreases	260 pounds
4. Area of rib eye (increase)	Increases	3 square inches

Class is the purpose for which an animal is to be used. It is determined by age, sex, sex condition and finish.

Quality grade refers to the quality of the meat (palatability). **Yield grade** refers to the amount of lean meat.

MARKET GRADES AND CLASSES OF LIVESTOCK
UNIT V

ASSIGNMENT SHEET #2--CLASSIFY LIVE CATTLE ACCORDING TO SLAUGHTER AND FEEDER GRADES

Using the chart below, indicate in the square the class and grade that you believe most nearly fits the animal that you are evaluating. Check with instructor for evaluation.

Commercial Cattle Grading Card

Name ______________________ **Address** ______________________________ **Chapter** ________________

	Classes						Slaughter Grades													%	Feeder Grades							
							Yield					Quality																
	Slaughter Calf	Slaughter Steer	Slaughter Heifer	Slaughter Cow	Feeder Steer	Feeder Heifer	1	2	3	4	5	Prime	Choice	Good	Standard	Commercial	Utility	Cutter	Canner	Dressing	Prime	Choice	Good	Standard	Utility	Inferior	Score	
1																												1
2																												2
3																												3
4																												4
5																												5
6																												6
7																												7
8																												8
9																												9
10																												10
11																												11
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13																												13
14																												14
15																												15
16																												16

MARKET GRADES AND CLASSES OF LIVESTOCK
UNIT V

ASSIGNMENT SHEET #3--CLASSIFY SWINE ACCORDING TO SLAUGHTER GRADES

Using the chart below, indicate in the square the degree of muscling, average back fat, and grade that you believe most nearly fit the animal that you are evaluating. Check with instructor for evaluation.

SWINE GRADING CARD

Class Name ______________________ Class Number ______________________

Contestant Name ______________________ Contestant Number ______________________

	Degree of Muscling					Average Back Fat						Score			
Animal Number	Very Thick	Thick	Moderately Thick	Slightly Thin	Thin	1.00 and Under	1.01-1.39	1.40-1.69	1.70-1.99	2.00 and Over	U.S. Grade	Muscling	Back Fat	U.S. Grade	Total
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															

Contestant will place an X in the proper variation of "Degree of Muscle" and also "Average Back Fat" for each animal. Contestant must also record the final U.S. Grade for each animal. All grades will not necessarily be represented.

The U.S. Grades of swine are Numbers 1, 2, 3, 4, and utility (refer to USDA Marketing Bulletin No. 51).

Three points will be granted for correctly identifying the degree of muscling and average back fat; four points for correctly identifying the U.S. Grade. No partial credit will be given.

MARKET GRADES AND CLASSES OF LIVESTOCK
UNIT V

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1

1. 1.75 - 1 Low
2. 3.5 - 3 Average
3. 2.45 - 2 Average
4. 2.66 - 2 Average
5. 4.05 - 4 High
6. 2.5 - 2 Average

Assignment Sheet #2--Evaluated to satisfaction of instructor

Assignment Sheet #3--Evaluated to satisfaction of instructor

MARKET GRADES AND CLASSES OF LIVESTOCK
UNIT V

TEST

NAME ______________________ SCORE ______________

1. Match the terms on the right to the correct definitions.

_____a. Animal that is intended for intensive feeding in preparation for slaughter

_____b. Cow recently freshened or soon due to calve, which is sold for milking purposes

_____c. Grouping of livestock according to the purpose for which an animal is to be used

_____d. Relative degree of excellence; final subdivision in a classification for marketing any kind of livestock

_____e. Calf which is of weaning age and is sold to go back into the country for further growing or finishing

_____f. Animal that is intended for immediate slaughter or that is more suitable for slaughter than for any other purpose

_____g. Animal that is intended for further growth for pasturing and rough feeding

_____h. Calf between the ages of three months and one year which usually received grain in addition to milk and is fat enough for slaughter

_____i. Young lamb under one year of age that is fat enough for immediate slaughter

_____j. Young lamb under one year of age that carries sufficient finish for slaughter purposes but which shows indications of making good gains if placed on feed

1. Grade of livestock
2. Feeder animal
3. Yield grade
4. Stocker animal
5. Slaughter lamb
6. Feeder lamb
7. Feeder calf
8. Slaughter calf
9. Milker or springer
10. Slaughter animal
11. Class of livestock
12. Slaughter sheep
13. Feeder sheep
14. Shearer lamb

_____k. Amount of lean meat

_____l. Yearling or older animal intended for immediate slaughter

_____m. Lamb intended for shearing and further finishing prior to slaughtering

_____n. Yearling or older animal best suited for further finishing

2. List three factors that determine market classes of cattle.

a. ______________________________

b. ______________________________

c. ______________________________

3. Select from the following list factors that should be considered in selecting feeder cattle by placing an "X" in the spaces provided.

_____a. Sex

_____b. Fat

_____c. Lack of thrift

_____d. Breeding

_____e. Presence of horns

_____f. Use

_____g. Uniformity

_____h. Age

_____i. Temperament and disposition

4. Name the five classes of cattle according to sex.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

5. Match the approximate age ranges for cattle on the right to the correct definitions by placing the correct numbers in the spaces provided.

_____a. Cattle from 24 to 36 months of age
_____b. Cattle from 12 to 24 months of age
_____c. Cattle that are over 36 months of age
_____d. Cattle under three months of age
_____e. Young cattle between the vealer and yearling stage

1. Vealers
2. Calves
3. Yearlings
4. Two-year-olds
5. Older cattle

6. Select from the following list indicators of yield grades by placing an "X" in the spaces provided.

_____a. Size of ribeye muscle
_____b. Live weight
_____c. Quantity of kidney, pelvic, and heart fat
_____d. Length of carcass
_____e. Amount of external fat

7. List factors which are used in preliminary yield grade schedule.

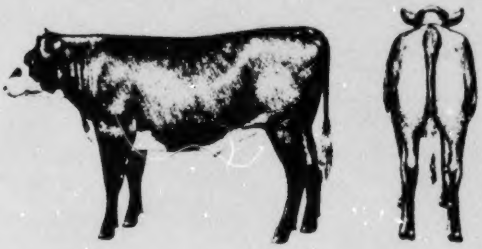
a. ______________________________
b. ______________________________
c. ______________________________
d. ______________________________

8. Calculate the final yield grades for the following carcasses using the formula below.

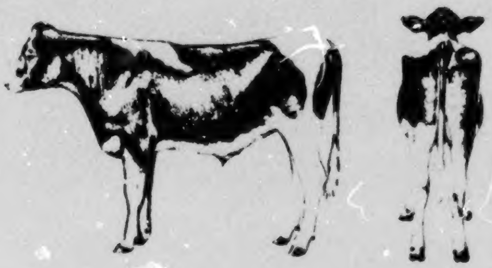
PYG ± carcass weight ± ribeye area ± kidney fat = Yield grade

	Fat Thickness	Carcass Weight	Rib eye	Kidney Fat		YG
a.	0.4	625#	12 sq in	3.5	=	_______
b.	1.0	750#	14 sq in	3.5	=	_______
c.	0.2	550#	10 sq in	3.0	=	_______

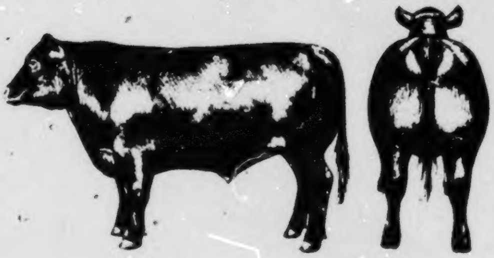
9. Identify the following slaughter grades of cattle.



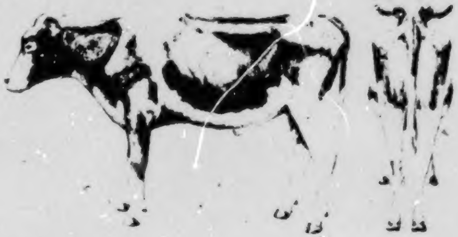
a. ____________________



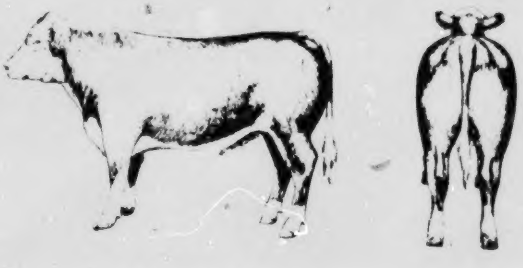
b. ____________________



c. ____________________

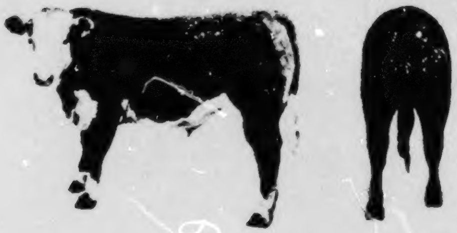


d. ____________________

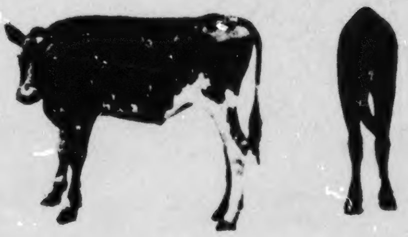


e. ____________________

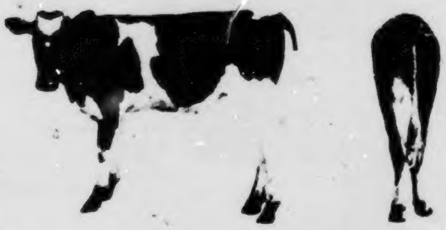
10. Identify the following feeder grades of cattle.



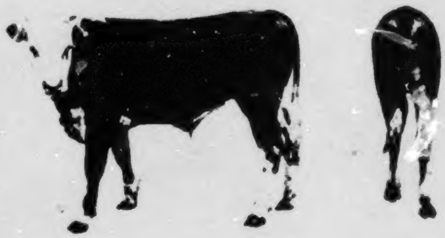
a. ______________________



b. ______________________



c. ______________________



d. ______________________

e. ______________________

11. Select from a list factors that determine market classes of sheep by placing an "X" in the spaces provided.

______a. Age of carcass

______b. Sex

______c. Weight

12. Name the three classes of sheep according to sex.

a. ____

b. ____

c. ____

13. Match the age groups of sheep on the right to the correct definitions.

______a. Young sheep between one and two years of age

______b. Sheep with teeth which are long and spread apart on the surface

______c. Lamb usually less than three months of age at slaughter which is born and marketed out of season

______d. Sheep between 24 and 36 months old which has cut its second pair of permanent incisor teeth

______e. Sheep with all incisors missing or worn down to the gums

______f. Lamb arriving at the market in the spring of the year and which ranges from three to seven months of age

______g. Sheep showing loss of teeth

______h. Young ovine animal that does not classify as either a hothouse or spring lamb

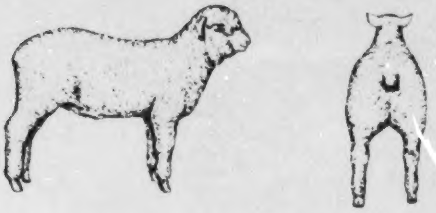
______i. Animal two or more years old

______j. Sheep between 36 and 48 months old which has cut its third pair of permanent incisor teeth

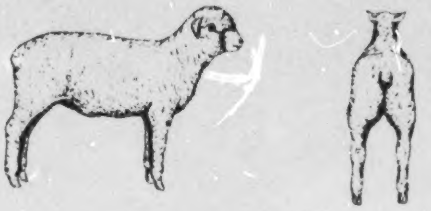
______k. Sheep between 48 and 60 months old which has a full set of permanent incisors

1. Hothouse lamb
2. Spring lamb
3. Lamb
4. Yearling
5. Two-year-old
6. Three-year-old
7. Four-year-old
8. Mature sheep
9. Broken-mouthed
10. Gummer
11. Spreader

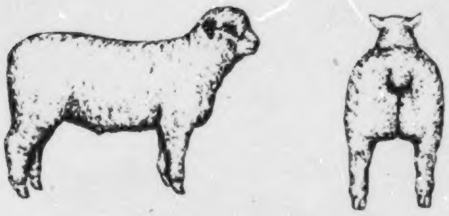
14. Identify the market grades of slaughter lambs.



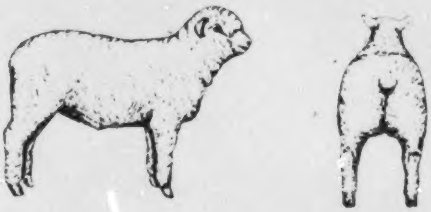
a. ____________________



b. ____________________



c. ____________________



d. ____________________

15. Select from the following list factors that determine market classes of swine.

_____a. Conformation

_____b. Weight

_____c. Sex

_____d. Age

16. Name the five classes of swine according to sex.

a. ____________________

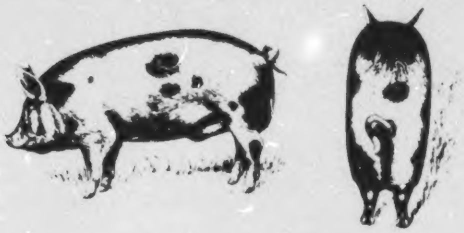
b. ____________________

c. ____________________

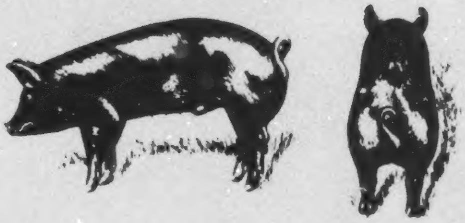
d. ____________________

e. ____________________

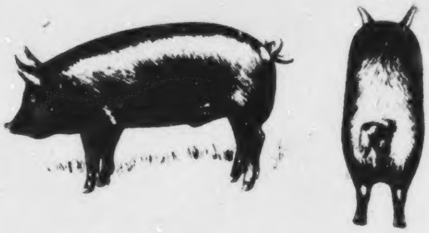
17. Identify the slaughter grades of swine.



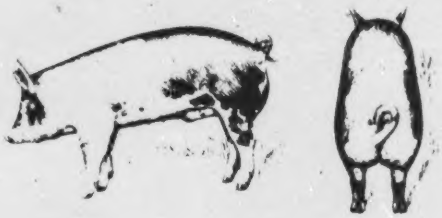
a. ____________________



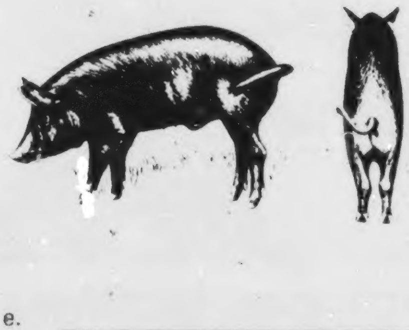
b. ____________________



c. ____________________

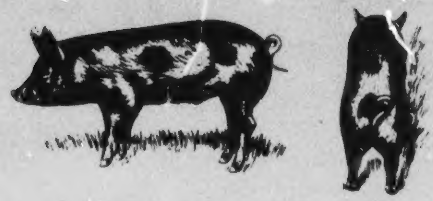


d. ____________________

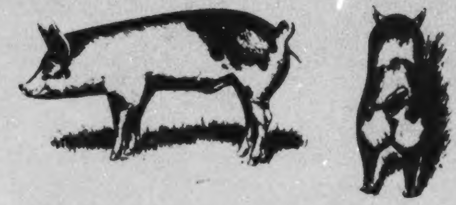


e. ____________________

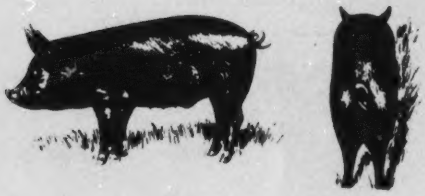
18. Identify the feeder grades of swine.



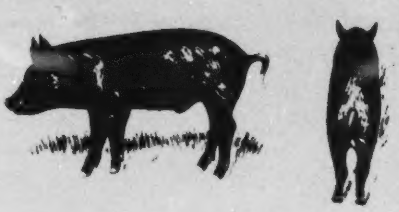
a. ______________________



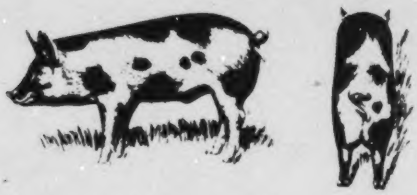
b. ______________________



c. ______________________



d. ______________________



e. ______________________

19. Classify live cattle according to slaughter and feeder grades.

20. Classify swine according to slaughter grades.

(NOTE: If activities 19 and 20 have not been accomplished prior to the test, ask the instructor when they should be completed.)

MARKET GRADES AND CLASSES OF LIVESTOCK
UNIT V

ANSWERS TO TEST

1. a. 2
   b. 9
   c. 11
   d. 1
   e. 7
   f. 10
   g. 4
   h. 8
   i. 5
   j. 6
   k. 3
   l. 12
   m. 14
   n. 13
2. a. Sex
   b. Age
   c. Weight
3. a, d, f, g, h, i
4. a. Steer
   b. Heifer
   c. Cow
   d. Bull
   e. Stag

5. a. 4
   b. 3
   c. 5
   d. 1
   e. 2

6. a, c, e

7. a. Fat thickness over rib eye
   b. Carcass weight
   c. Rib eye
   d. Kidney fat

8. a. 2.8 2 low
   b. 4.2 4 high
   c. 2.5 2 average

9. a. Good
   b. Standard
   c. Prime
   d. Utility
   e. Choice

10. a. Good
    b. Utility
    c. Standard
    d. Prime
    e. Choice

11. b, c

12. a. Ewe
    b. Wether
    c. Ram

13. a. 4

b. 11

c. 1

d. 5

e. 10

f. 2

g. 9

h. 3

i. 8

j. 6

k. 7

14. a. Good

b. Utility

c. Prime

d. Choice

15. a, b

16. a. Boar

b. Barrow

c. Gilt

d. Sow

e. Stag

17. a. U.S. No. 4

b. U.S. No. 1

c. U.S. No. 3

d. U.S. No. 2

e. U.S. Utility

18. a. U.S. No. 2
    b. U.S. No. 1
    c. U.S. No. 4
    d. U.S. Utility
    e. U.S. No. 3

19. Evaluated to the satisfaction of the instructor

20. Evaluated to the satisfaction of the instructor

MARKETING LIVESTOCK AND MARKET AGENCIES
UNIT VI

UNIT OBJECTIVE

After completion of this unit, the student should be able to distinguish between a terminal market and a livestock auction and should be able to evaluate these markets and select the one that would most nearly fit the home farm or ranch operation. The student should be able to discuss the benefits of direct marketing and should be able to calculate shrinkage, grade, and yield and be able to apply these to the enterprise the student is marketing. This knowledge will be evidenced by completion of assignment sheets and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with marketing livestock to the correct definitions.
2. Select from a list occupations that are available in the livestock marketing industry.
3. Distinguish between a terminal market and a livestock auction.
4. Discuss in a short paragragh the advantages of direct marketing.
5. Select from a list characteristics of the Packers and Stockyards Act.
6. Name methods of selling cattle at a livestock auction.
7. Select from a list types of charges used by most livestock auctions.
8. Name the types of selling fees used most often by the livestock auction owners.
9. Select from a list factors that determine dressing percentage of cattle.
10. Name factors on which yield grades are based.
11. Match types of shrinkage to the correct definitions.
12. Distinguish between do's and don'ts for keeping shrinkage to a minimum.
13. Select from a list the major cause of livestock bruises.
14. Calculate selling prices of livestock when given the kind of livestock, number, price per hundredweight, and the shrinkage, if any.
15. Calculate selling prices of hogs and cattle according to yield and grade.

MARKETING LIVESTOCK AND MARKET AGENCIES
UNIT VI

SUGGESTED ACTIVITIES

I. Suggested activities for the instructor:

   A. Provide student with objective sheet.

   B. Provide student with information and assignment sheets.

   C. Discuss unit and specific objectives.

   D. Discuss information and assignment sheets.

   E. Work assignment sheets before class.

   F. Arrange field trip to observe market agencies in operation.

   G. Arrange for a commission company buyer to act as a resource person for class.

   H. Secure slides to show the effect of buying livestock.

   I. Develop a concentration game using terms and definitions for livestock markets.

   J. Subscribe to the *Oklahoma Market Report* from the State Department of Agriculture.

   K. Give test.

   L. Reteach if necessary.

II. Instructional materials:

   A. Objective sheet

   B. Information sheet

   C. Assignment sheets

      1. Assignment Sheet #1--Calculate Shrinkage and Selling Price

      2. Assignment Sheet #2--Calculate Selling Price Using Grade and Yield

   D. Answers to assignment sheets

   E. Test

   F. Answers to test

III. Unit references:

A. Fowler, Stewart H. *Beef Production in the South*. Danville, Illinois: The Interstate Printers and Publishers, Inc., 1969.

B. Ensminger, M. Eugene. *Animal Science*. Danville, Illinois: The Interstate Printers and Publishers, Inc., 1965.

C. Ensminger, M. Eugene. *Swine Science*. Danville, Illinois: The Interstate Printers and Publishers, Inc., 1970.

D. Bundy, Clarence E., and Diggins, Ronald V. *Swine Production*. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1971.

E. Bundy, Clarence E., and Diggins, Ronald V. *Beef Production*. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1971.

MARKETING LIVESTOCK AND MARKET AGENCIES
UNIT VI

INFORMATION SHEET

I. Terms and definitions

A. Commission--Fee or charge paid by the seller to an agent for selling services; fee or charge paid by the purchaser to an agent for the buying of livestock

B. Auction--Market at which livestock are displayed in a ring and offered for sale to the highest bidder

C. Commission company--Market agency that receives livestock on consignment to be sold on an agency basis for an established fee

D. Contract selling--Agreement between an owner and a buyer on the price of livestock which sets forth the provisions relating to the description, delivery date, weighing point, and delivery point prior to the delivery of the livestock

E. Cooperative marketing--Method of selling livestock in which the service is performed by, or on behalf of, a voluntary association of livestock producers

F. Direct marketing--Transfer of ownership of livestock from the seller to the purchaser without the service of an agency

G. Market agency--Agency engaged in the business of buying or selling livestock on a commission basis

H. Order buyer--Individual who purchases livestock for others

I. Shrinkage--Loss in weight of the animals caused by the movement of livestock from one place to another

(NOTE: The practice of adding to or deducting from actual weight is referred to as *pencil shrinkage*. Pencil shrinkage is usually considered as two to three percent.)

J. Packer market--Facility operated privately and solely by a packer or slaughterer where livestock is purchased directly from the producer for slaughter

K. Supply--Quantity of a product that is placed on the market at any given time

L. Terminal market--Trading center where facilities are provided for receiving, caring for, and handling livestock; where several selling agencies are in operation; and where the privileges of buying and selling are available to all who wish to use them

INFORMATION SHEET

M. Livestock auction--Trading center where livestock are assembled at regular intervals and sold by public bidding

N. Trader or dealer--Individual, not a market agency, engaged in the business of buying or selling livestock for individual's own account, usually on a speculative basis

O. Dressing percentage--Percentage yield of chilled carcass in relation to the weight of the animal on foot

P. Carcass grade and yield selling--Type of transaction in which the packer makes a price bid based on the quality of the carcass as well as the carcass yield

II. Occupations available in the market industry

A. Order buyer

B. Packer buyer

C. Grader

D. Inspector

E. Weigher

F. Sale barn operator or owner

G. Bill-in person

H. Barn or yard worker

III. Terminal markets and livestock auctions

A. Terminal market

1. Livestock are assigned to a commission firm

2. Stockyard company furnishes pens, scales, feed, and water for a fee

(NOTE: The company usually charges 75 cents to $1.25 per head.)

3. Livestock are usually sold five days a week

(NOTE: The Oklahoma City terminal market is number one in the sale of feeder calves.)

INFORMATION SHEET

B. Livestock auction

    1. Sales are held weekly

    2. Market is usually locally owned and operated

    3. All classes of livestock are sold

    4. Selling service is paid by commission based on percentage of selling price

IV. Advantages of direct marketing

A. Sale of livestock direct to packers and feeders without services of selling agents

B. Seller and purchaser can agree on price per hundredweight

V. Packers and Stockyards Act

(NOTE: This federal statute regulates business practices of those engaged in interstate commerce in livestock and live poultry marketing and meat and poultry packing.)

A. Helps establish true market value of livestock and poultry

B. Protects consumers against unfair business practices

C. Is administered by USDA

D. Covers registering and bonding, facilities and rates, and scales and weighing

VI. Methods of selling cattle at livestock auction

A. By the head

B. By weight

C. By grade

(NOTE: Animals are graded, weighed, and sorted into lots of uniform quality and weight and are sold together.)

VII. Livestock auction charges

A. Commission for selling

B. Yardage

C. Feed

D. Health and brand inspection

INFORMATION SHEET

- E. Insurance
- F. Vaccination
- G. Brucellosis (Bang's) testing

VIII. Types of selling fees used at livestock auctions

- A. Percentage of gross sales
- B. Per head basis

  (NOTE: This method is used most often. Cattle charges range from $1.50 to $2.00. Charges for calves range from $1.00 to $1.50 per head.)

- C. Combination of both

IX. Factors determining dressing percentage of cattle

- A. Quality of flesh, both lean and fat
- B. Amount of fill; stage of pregnancy
- C. Refinement of head, bone, and hide

X. Factors on which yield grades are based

- A. Amount of external fat
- B. Size of ribeye muscle
- C. Amount of kidney, pelvic, and heart fat
- D. Carcass weight

XI. Types of shrinkage

- A. Excretory--Decrease due to elimination of feces and urine
- B. Tissue--Actual decrease in the carcass weight of cattle

XII. Do's and don'ts for minimizing shrinkage

- A. Do
  1. Condition cattle several days prior to shipment
  2. Plan the shipping program
  3. Sort heifers and steers if possible

INFORMATION SHEET

4. Keep cattle off feed and water before shipping
5. Allow time for fill back if cattle have been in transit more than 12 hours

B. Don't

1. Overfill cattle before hauling
2. Overcrowd or underload shipment
3. Delay shipment after cattle are ready for movement
4. Overfill cattle at destination
5. Rush or crowd cattle while loading

XIII. Causes of cattle bruises

A.	Crowding, bumping, and rushing	66%
B.	Trampling	14%
C.	Cane, whip, or club	10%
D.	Horned cattle	3%
E.	Other causes	7%

XIV. Calculating selling prices according to price per hundredweight

A. Price per hundredweight x weight of live animal

or

B. Dollar value per head regardless of weight of live animal

Examples:

1. 5 Angus steers with average weight of 525 lbs sold for $38.50 per hundredweight

   525 lbs x $38.50 per hundredweight = $202.13 per head
   $202.13 x 5 head = $1,010.65

2. 5 Hereford steers sold direct, given a 3% shrinkage, and weighing an average 525 lbs live weight; sold on a $38.50 market

   3% shrinkage x 525 lbs live weight = 15.75 lbs

   525 lbs - 16 lbs = 509 lbs
   $38.50 per hundredweight x 509 lbs = $195.97 per head
   $195.97 x 5 head = $979.85

INFORMATION SHEET

XV. Calculating selling prices according to grade and yield

A. Cattle--Carcass weight and the grade the carcass yields determines the selling price

Example: A 1,000-lb steer hangs up a 560-lb carcass and is given a yield value of 50 cents/lb
560 lbs x 50 cents = $280.00

(NOTE: The live weight is not a factor. Higher or lower grades are adjusted up or down.)

B. Hogs--Amount of carcass produced for live weight purchased determines selling price

Example: Carcass weight ÷ live weight
142-lb carcass ÷ 200 lbs live weight = 71 percent yield

MARKETING LIVESTOCK AND MARKET AGENCIES
UNIT VI

ASSIGNMENT SHEET #1--CALCULATE SHRINKAGE AND SELLING PRICES

Work each problem listed below and turn in to your instructor for evaluation.

1. Suppose you sold 20 head of Angus steers direct to a feeder to be delivered at the local livestock auction for weighing. You agreed on price of $37.50 per hundredweight and gave a 3% shrinkage. Your calves averaged 575 lbs. What would be the total dollars received for your steers?

2. You sold seven Hereford steers to the local livestock auction. The steers averaged 375 lbs and brought $41.00 per hundredweight. How much money did you receive for the steers?

3. You sold five Hereford heifers for $36.50 per hundredweight, and they averaged 560 lbs. What was the amount of money you received?

ASSIGNMENT SHEET #1

4. Suppose you had the option to sell 150 head of steers either at the local livestock auction or at a terminal market which is 100 miles from your farm. According to the information at the terminal market, steers similar to yours are bringing $38.75 per hundredweight. You estimated that the steers would weigh 575 lbs on the average. Last week's local livestock auction was 75 cents lower than the terminal market. Using an estimated shrinkage of 4% on hauling to the terminal market and selling for $38.75 per hundredweight, would it be more profitable to sell at the livestock auction or at the terminal market? Why?

MARKETING LIVESTOCK AND MARKET AGENCIES
UNIT VI

ASSIGNMENT SHEET #2--CALCULATE SELLING PRICE USING GRADE AND YIELD

Work each problem listed below and turn in to your instructor for evaluation.

1. You sold five market hogs which graded U.S. No. 1. The hogs averaged 215 lbs live weight, and the carcasses averaged 148 lbs. What was the percent yield?

2. You sold two Angus steers using a yield grade of 45 cents per pound. The steers average live weight was 950 lbs, and the average carcass weight was 500 lbs. What was the value of the steers?

3. You sold 20 Hereford steers which averaged 750 lbs live weight and hung up a 400 lb carcass. Using a yield grade factor of 50 cents per pound, what would be the value of the steers?

   Using a price of $30.50 per hundredweight, what would be the value of the steers?

MARKETING LIVESTOCK AND MARKET AGENCIES
UNIT VI

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1

1. $4,185.00

2. $1,076.25

3. $1,022.00

4. Local livestock auction

   By shipping them to the terminal market, you would be losing 23 lbs per steer on shrinkage, plus the cost for trucking them

   Terminal market

   575 lbs - 23 lbs shrinkage = 552 lbs
   552 x $38.75 per hundredweight = $213.90 per steer or $32,085.00

   Local livestock auction

   575 lbs x $38.00 per hundredweight = $218.50 per steer or $32,775.00 for the 150 head

Assignment Sheet #2

1. 68.8% or 69%

2. $450.00

3. $4,000.00 yield grade

   $4,575.00 live weight sale

MARKETING LIVESTOCK AND MARKET AGENCIES
UNIT VI

TEST

NAME ______________________________ SCORE ______________

1. Match the terms on the right to the correct definitions. (Answers for "a" through "h" are on this page.)

_____a. Individual who purchases livestock for others

_____b. Fee or charge paid by the seller to an agent for selling services; fee or charge paid by the purchaser to an agent for the buying of livestock

_____c. Method of selling livestock in which the service is performed by, or on behalf of, a voluntary association of livestock producers

_____d. Percentage yield of chilled carcass in relation to the weight of the animal on foot

_____e. Facility operated privately and solely by a packer or slaughterer where livestock is purchased directly from the producer for slaughter

_____f. Individual, not a market agency, engaged in the business of buying or selling livestock for individual's own account, usually on a speculative basis

_____g. Agreement between an owner and a buyer on the price of livestock which sets forth the provisions relating to the description, delivery date, weighing point, and delivery point prior to the delivery of the livestock

_____h. Loss in weight of the animals caused by the movement of livestock from one place to another

1. Commission
2. Dressing percentage
3. Trader or dealer
4. Contract selling
5. Cooperative marketing
6. Shrinkage
7. Packer market
8. Order buyer

______i. Trading center where facilities are provided for receiving, caring for, and handling livestock; where several selling agencies are in operation; and where the privileges of buying and selling are available to all who wish to use them

______j. Market at which livestock are displayed in a ring and offered for sale to the highest bidder

______k. Transfer of ownership of livestock from the seller to the purchaser without the service of an agency

______l. Agency engaged in the business of buying or selling livestock on a commission basis

______m. Trading center where livestock are assembled at regular intervals and sold by public bidding

______n. Type of transaction in which the packer makes a price bid based on the quality of the carcass as well as the carcass yield

______o. Market agency that receives livestock on consignment to be sold on an agency basis for an established fee

______p. Quantity of a product that is placed on the market at any given time

9. Direct marketing
10. Market agency
11. Supply
12. Terminal market
13. Livestock auction
14. Commission company
15. Auction
16. Carcass grade and yield selling

2. Select from the following list occupations that are available in the livestock marketing industry. Place an "X" in the spaces provided.

______a. Barn or yard worker

______b. Sale barn operator or owner

______c. Order buyer

______d. Carcass grader

______e. Weigher

______f. Veterinarian

_____g. Packer buyer

_____h. Concession operator

_____i. Inspector

3. Distinguish between a terminal market and a livestock auction by placing "TM" in the blank if the statement describes the operation of a terminal market and "LA" in the blank if the statement describes the operation of a livestock auction.

_____a. Livestock are usually sold five days a week

_____b. Livestock are assigned to a commission firm

_____c. Market is usually locally owned and operated

_____d. Selling service is paid by commission based on percentage of selling price

_____e. Stockyard company furnishes pens, scales, feed, and water for a fee

_____f. Sales are held weekly

_____g. All classes of livestock are sold

4. Discuss in a short paragraph the advantages of direct marketing.

____

____

____

____

5. Select from the following list the characteristics of the Packers and Stockyards Act.

_____a. Establishes price of livestock and poultry

_____b. Covers registering and bonding, facilities and rates, and scales and weighing

_____c. Protects consumers against unfair business practices

_____d. Helps establish true market value of livestock only

_____e. Is administered by USDA

6. Name three methods of selling cattle at a livestock auction.

a. ____________________

b. ____________________

c. ____________________

7. Select from the following list types of charges used by most livestock auctions.

_____a. Insurance

_____b. Brucellosis (Bang's) testing

_____c. Hauling

_____d. Feed

_____e. Yardage

_____f. Commission for buying

_____g. Health and brand inspection

8. Name the three types of selling fees used most often by the livestock auction owners.

a. ____________________

b. ____________________

c. ____________________

9. Select from the following list factors that determine dressing percentage of cattle.

_____a. Refinement of head, bone, and hide

_____b. Age of animal

_____c. Amount of fill; stage of pregnancy

_____d. Sex

_____e. Quality of flesh, both lean and fat

10. Name four factors on which yield grades are based.

a. ____________________

b. ____________________

c. ____________________

d. ____________________

11. Match the types of shrinkage on the right to the correct definitions.

_____a. Actual decrease in the carcass weight of cattle	1. Tissue
_____b. Decrease due to elimination of feces and urine	2. Excretory

12. Distinguish between do's and don'ts for keeping shrinkage to a minimum by placing a "DO" in front of the do's and a "DON'T" in front of the don'ts in the spaces provided.

_____a. Sort heifers and steers if possible

_____b. Overfill cattle before hauling

_____c. Plan the shipping program

_____d. Rush or crowd cattle while loading

_____e. Keep cattle off feed and water before shipping

_____f. Overcrowd or underload shipment

_____g. Delay shipment after cattle are ready for movement

_____h. Condition cattle several days prior to shipment

_____i. Allow time for fill back if cattle have been in transit more than 12 hours

13. Select the major cause of livestock bruises from the list below.

_____a. Horned cattle

_____b. Cane, whip, or club

_____c. Crowding, bumping, and rushing

_____d. Trampling

_____e. Other causes

14. Calculate the selling price in the following problem.

You sold six head of steers which averaged 465 lbs live weight. They brought $37.50 per hundredweight, and you gave a 3% shrinkage. How much money did you receive for your steers?

15. Calculate the following problems and show your work.

    a. You sold three market barrows according to yield and grade. The barrows averaged 225 lbs live weight, and the carcass averaged 168 lbs. What is the percent yield?

    b. You sold a 980-lb Hereford steer which hung up a 565-lb carcass. The carcass graded good and received a grade price of 45 cents. What was the value of the steer?

MARKETING LIVESTOCK AND MARKET AGENCIES
UNIT VI

ANSWERS TO TEST

1. a. 8
   b. 1
   c. 5
   d. 2
   e. 7
   f. 3
   g. 4
   h. 6
   i. 12
   j. 15
   k. 9
   l. 10
   m. 13
   n. 16
   o. 14
   p. 11

2. a, b, c, e, g, i

3. a. TM
   b. TM
   c. LA
   d. LA
   e. TM
   f. LA
   g. LA

4. Discussion should include:
   a. Sale of livestock direct to packers and feeders without services of selling agents
   b. Seller and purchaser can agree on price per hundredweight

5. b, c, e

6. a. By the head
   b. By weight
   c. By grade

7. a, b, d, e, g

8. a. Percentage of gross sales
   b. Per head basis
   c. Combination of both

9. a, c, e

10. a. Amount of external fat

b. Size of ribeye muscle

c. Amount of kidney, pelvic, and heart fat

d. Carcass weight

11. a. 1

b. 2

12. a. Do

b. Don't

c. Do

d. Don't

e. Do

f. Don't

g. Don't

h. Do

i. Do

13. c

14. $1,014.78

15. a. 74.6% or 75%

b. $254.25

LIVESTOCK PRICE TRENDS AND CYCLES
UNIT VII

UNIT OBJECTIVE

After completion of this unit, the student should be able to interpret market information to determine when to market livestock in order to make the most profit and to interpret how livestock price trends and cycles fluctuate during the year. This knowledge will be evidenced by completion of assignment sheets and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with price trends and cycles to the correct definitions.
2. Name main factors that cause livestock prices to fluctuate.
3. Name ways in which progressive livestock producers use market changes.
4. Select from a list factors that affect seasonal high and low market prices.
5. Match types of price variations to the correct definitions.
6. Match types of livestock to the months of the year when it would be most profitable to market and/or purchase them.
7. Calculate prices for feeder pigs.
8. Collect and interpret market information from a local livestock auction and from a terminal market.

LIVESTOCK PRICE TRENDS AND CYCLES
UNIT VII

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

  A. Provide student with unit and specific objectives.

  B. Provide student with information and assignment sheets.

  C. Discuss unit and specific objectives.

  D. Discuss information and assignment sheets.

  E. Collect newspapers so student will have access to market information.

  F. Subscribe to the *Oklahoma Market Report* from the State Department of Agriculture.

  G. Subscribe and have on hand the following copies of state reports available from the State Department of Agriculture:

    1. *Oklahoma Cattle on Feed*
    2. *Oklahoma Agricultural Prices*
    3. *Oklahoma Crop-Weather Summary*
    4. *Oklahoma Crop-Production*
    5. *Oklahoma Livestock*
    6. *Oklahoma Acreage*

  H. Obtain graphs from Farm Credit Bank of Wichita.

  I. Arrange field trips to allow student an opportunity to see how livestock prices fluctuate.

  J. Develop and play a farm management game with student.

  K. Give test.

  L. Reteach if necessary.

II. Instructional materials:

  A. Objective sheet

  B. Information sheet

  C. Assignment sheets

    1. Assignment Sheet #1--Calculate Prices for Feeder Pigs

    2. Assignment Sheet #2--Collect and Interpret Terminal Livestock Market Information from a Newspaper

3. Assignment Sheet #3--Collect and Interpret the Local Livestock Auction Market Information

D. Answers to assignment sheets

E. Test

F. Answers to test

III. Unit references:

A. Ensminger, M. Eugene. *Animal Science*. Danville, Illinois: The Interstate Printers and Publishers, Inc., 1965.

B. Fowler, Stewart H. *Beef Production in the South*. Danville, Illinois: The Interstate Printers and Publishers, Inc., 1969.

C. Bundy, Clarence E., and Diggins, Ronald V. *Beef Production*. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1971.

LIVESTOCK PRICE TRENDS AND CYCLES
UNIT VII

INFORMATION SHEET

I. Terms and definitions

   A. Supply--Number of livestock available for the day's trading market

   B. Demand--Buyer's desire to purchase a certain volume; buyer's willingness and ability to buy

   C. Demand is good--Buyers are more aggressive than usual; large or increased supply shipments are bringing unchanged or higher prices

   D. Demand is poor--Buyers are less aggressive than usual; decreased supplies are selling at unchanged or lower prices

   E. Trading active--Sales are being made at a more rapid pace than usual for the particular market

   F. Trading moderately active--Sales are being made at a normal pace for the particular market

   G. Trading slow--Sales are being made at a slower than normal pace for the particular market

   H. Price--Specific dollars and cents paid per hundredweight (cwt) for a given grade and weight selection

   I. Seasonal price index--Usual price change from month to month during the year based on prices over a number of years

   J. Price cycle--Period of time during which the price of a certain kind of livestock advances from a low point to a high point and then declines to a low point again

II. Factors causing price fluctuations

   A. Supply

   B. Demand

   (NOTE: Supply refers to the number produced and marketed at a given time and place. Demand is measured by the quantity purchased and the price. When supply and demand are balanced, prices are stable.)

III. Ways to use seasonal market changes

   A. Making management decisions

   B. Planning buying and selling operations

INFORMATION SHEET

IV. Factors affecting seasonal high and low market prices

- A. Federal farm programs and controls
- B. Business conditions and general price levels
- C. Feed supplies and water conditions
- D. Wars

V. Price variations

- A. Long-time trend--Level of prices over a long period of time, usually caused by economic conditions
- B. Cycle--Time period during which the price for a certain species of livestock advances from a low point to a high point and then returns to a low point as caused by the change in the number of livestock slaughtered
- C. Seasonal--Price of cattle during the twelve-month period whether at a high or a low rate as caused by the number of livestock marketed

  (NOTE: Seasonal variations tend to follow a similar pattern from year to year.)
- D. Short-time and irregular--Fluctuation of prices day to day or from week to week as caused by the decision of large numbers of producers to sell today, tomorrow, this week, or next week

VI. When to buy and sell livestock

- A. Cattle
  - 1. Slaughter steers
    - a. Prime, Choice, and Good
      - 1) Highest prices are in April and September
      - 2) Lowest prices are in June and from October to February

        (NOTE: The lowest prices for the top three grades are in June because it coincides with the season of heaviest receipts. This is brought about because most feeders winter-feed and market in the late spring. The price spread between Prime and Choice is the widest from January through April.)

INFORMATION SHEET

- b. Other grades
    - 1) Highest prices are from August to October
    - 2) Lowest prices are from December to March
- 2. Slaughter heifers
    - a. Highest prices are in January and August
    - b. Lowest prices are from September through November

      (NOTE: Price is not influenced significantly by the price of slaughter steers. It appears that a three- to four-cent spread is always present between heifers and steers.)
- 3. Cows
    - a. Highest prices are from March to July
    - b. Lowest prices are from October to February

      (NOTE: This is due to the heavy run of grass cattle in the late fall.)
- 4. Feeeder calves
    - a. Highest prices are from March to May
    - b. Lowest prices are in December

      (NOTE: December reflects the highest receipts, and the March to May high is reflecting demand for steers to go on grass and into feedlots. Feeder cattle receipts are greatest in the fall.)

B. Sheep

- 1. Grass-finished lambs
    - a. Highest prices are in May and June
    - b. Lowest prices are from August to December

      (NOTE: Early lambs have price advantages. Breed ewes so lambs will come early; keep them on good spring pasture. Creep feeding is profitable.)

INFORMATION SHEET

2. Fed lambs
    a. Highest prices are from February to May
    b. Lowest prices are from December to February

       (NOTE: Fed lambs are hard to market according to seasonal cycles. A feeder must buy lambs when they are available and must market them before they become too old and heavy.)

3. Feeder lambs
    a. Highest prices are from December to April

       (NOTE: Very few lambs are available to take advantage of this high price.)

    b. Lowest prices are from May through September

       (NOTE: July and August are the highest summer month prices when lambs are available.)

C. Swine

1. Market barrows and gilts
    a. Highest prices are from June through August

       (NOTE: Take advantage of high prices by regulating farrowing dates of sows and by controlling feeding to correspond with high price markets. The consumer today normally prefers a light carcass. This is what has caused the spread between light and heavy weights.)

    b. Lowest markets are in November, December, March, and April

       (NOTE: The bulk of spring and early summer pigs farrowed are marketed in November to May. This is what normally causes the lowest prices of the year.)

2. Sows
    a. Highest prices are in June to October

       (NOTE: This is brought about because of the bulk of spring farrowing. Following weaning, sows are marketed.)

    b. Lowest prices are in December

INFORMATION SHEET

3. Feeder pigs

   a. Highest prices are from February through April

   b. Lowest prices are in July

LIVESTOCK PRICE TRENDS AND CYCLES
UNIT VII

ASSIGNMENT SHEET #1--CALCULATE PRICES FOR FEEDER PIGS

Using the information given, complete the following table to determine prices to pay for feeder pigs.

Examples of purchase calculations:

34 to 39 pound pig = 1.7 x value of top market hogs

40 to 45 pound pig = 1.6 x value of top market hogs

46 to 51 pound pig = 1.5 x value of top market hogs

52 to 57 pound pig = 1.4 x value of top market hogs

(NOTE: The above formula courtesy of Mr. C. A. Collins, former Oklahoma vocational agriculture district supervisor.)

Number one slaughter barrows are selling for $46.00/cwt, what could you afford to pay for the following feeder pigs?

1. 45-lb Duroc barrow ____________
2. 50-lb Hampshire barrow ____________
3. 60-lb crossbred barrow ____________
4. 35-lb Duroc barrow ____________
5. 40-lb Yorkshire barrow ____________

LIVESTOCK PRICE TRENDS AND CYCLES
UNIT VII

ASSIGNMENT SHEET #2--COLLECT AND INTERPRET TERMINAL LIVESTOCK MARKET INFORMATION FROM A NEWSPAPER

Collect the following livestock market information from a newspaper showing yesterday's receipts and prices. When completed, turn in to the instructor for evaluation.

Cattle and calves, no. of head ___________

Activity of the market ___________

Price range

Slaughter steers ___________

Weights ___________

Weights ___________

Slaughter heifers ___________

Weights ___________

Weights ___________

Slaughter cows ___________

Bulls ___________

Slaughter calves ___________

Feeder cattle ___________

Feeder calves ___________

Cow-calf pairs ___________

Hogs, no. of head ___________

Activity of market ___________

Price range

U.S. No. 1 ___________ Weight ___________

U.S. No. 2 ___________ Weight ___________

ASSIGNMENT SHEET #2

U.S. No. 3 __________ Weight __________

U.S. No. 4 __________ Weight __________

Sows __________

Sheep, no. of head __________

Activity of market __________

Price range

Slaughter ewes __________

Feeder lambs __________

Slaughter lambs __________

LIVESTOCK PRICE TRENDS AND CYCLES
UNIT VII

ASSIGNMENT SHEET #3--COLLECT AND INTERPRET THE LOCAL LIVESTOCK AUCTION MARKET INFORMATION

Collect the following livestock market information by visiting the local auction or reading or listening to a source of news media. When completed, turn in to the instructor for evaluation.

Cattle and calves, no. of head ___________

Activity of the market ___________

Price range

  Slaughter steers ___________

    Weights ___________

    Weights ___________

  Slaughter heifers ___________

    Weights ___________

    Weights ___________

  Slaughter cows ___________

  Bulls ___________

  Slaughter calves ___________

  Feeder cattle ___________

  Feeder calves ___________

  Cow-calf pairs ___________

Hogs, no. of head ___________

Activity of market ___________

Price range

  U.S. No. 1 ___________ Weight ___________

  U.S. No. 2 ___________ Weight ___________

ASSIGNMENT SHEET #3

U.S. No. 3 __________ Weight __________

U.S. No. 4 __________ Weight __________

Sows __________

Sheep, no of head __________

Activity of market __________

Price range

Slaughter ewes __________

Feeder lambs __________

Slaughter lambs __________

LIVESTOCK PRICE TRENDS AND CYCLE
UNIT VII

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1

1. $33.12
2. $34.50
3. $38.64
4. $27.37
5. $29.44

Assignment Sheet #2--Evaluated to satisfaction of instructor

Assignment Sheet #3--Evaluated to satisfaction of instructor

LIVESTOCK PRICE TRENDS AND CYCLES
UNIT VII

TEST

NAME ____ SCORE ________________

1. Match the terms on the right to the correct definitions.

_____a. Number of livestock available for the day's trading market

_____b. Buyer's desire to purchase a certain volume; buyer's willingness and ability to buy

_____c. Buyers are more aggressive than usual; large or increased supply shipments are bringing unchanged or higher prices

_____d. Sales are being made at a normal pace for the particular market

_____e. Usual price change from month to month during the year based on prices over a number of years

_____f. Period of time during which the price of a certain kind of livestock advances from a low point to a high point and then declines to a low point again

_____g. Sales are being made at a slower than normal pace for the particular market

_____h. Buyers are less aggressive than usual; decreased supplies are selling at unchanged or lower prices

_____i. Specific dollars and cents paid per hundredweight (cwt) for a given grade and weight selection

_____j. Sales are being made at a more rapid pace than usual for the particular market

1. Price cycle
2. Seasonal price index
3. Demand is poor
4. Demand is good
5. Trading slow
6. Supply
7. Demand
8. Trading moderately active
9. Price
10. Trading active

2. Name the two main factors that cause livestock prices to fluctuate.

a. ______________________________

b. ______________________________

3. Name two ways in which progressive livestock producers use seasonal market changes.

a. ______________________________

b. ______________________________

4. Select from the following list factors that affect seasonal high and low market prices.

______a. Wars

______b. Population

______c. Federal farm programs and controls

______d. Feed supplies and water conditions

______e. Business conditions and general price levels

5. Match the types of price variations on the right to the correct definitions.

______a. Time period during which the price for a certain species of livestock advances from a low point to a high point and then returns to a low point as caused by the change in the number of livestock slaughtered

______b. Fluctuation of prices day to day or from week to week as caused by the decision of large numbers of producers to sell today, tomorrow, this week, or next week

______c. Level of prices over a long period of time, usually caused by economic conditions

______d. Price of cattle during the twelve-month period whether at a high or a low rate as caused by the number of livestock marketed

1. Cycle

2. Long-time trend

3. Seasonal

4. Short-time and irregular

6. Match the types of livestock on the right to the months of the year when it would be most profitable to market and/or purchase them.

Suppose you were selling the following classes and types of livestock and wanted to sell when the price was at top value during the year.

_____a. April and September

_____b. August to October

_____c. January and August

_____d. March to May

_____e. March to July

_____f. May and June

_____g. February to May

_____h. December to April

_____i. June through August

_____j. June to October

_____k. February through April

1. Slaughter heifers
2. Feeder pigs
3. Slaughter steers of Prime, Choice, and Good grades
4. Cows
5. Feeder calves
6. Grass-finished lambs
7. Feeder lambs
8. Market barrows and gilts
9. Slaughter steers of grades other than Prime, Choice, and Good
10. Sows
11. Fed lambs

Suppose you wanted to purchase the following classes and types of livestock when the price is at the lowest during the year. (Some answers may be used more than once. Lists are continued on the following page.)

_____l. December to March

_____m. September through November

_____n. June; October to February

_____o. December

_____p. August to December

_____q. December to February

_____r. May through September

12. Fed lambs
13. Sows
14. Slaughter steers of grades other than Prime, Choice, and Good
15. Feeder lambs
16. Grass-finished lambs
17. Slaughter heifers

______s. November, December, March, and April

______t. July

______u. October to February

18. Feeder pigs

19. Cows

20. Feeder calves

21. Slaughter steers of Prime, Choice, and Good grades

22. Market barrows and gilts

7. Calculate prices for feeder pigs.

8. Collect and interpret market information from a local livestock auction and from a terminal market.

(NOTE: If activities 7 and 8 have not been accomplished prior to the test, ask the instructor when they should be completed.)

LIVESTOCK PRICE TRENDS AND CYCLES
UNIT VII

ANSWERS TO TEST

1. a. 6
   b. 7
   c. 4
   d. 8
   e. 2
   f. 1
   g. 5
   h. 3
   i. 9
   j. 10
2. a. Supply
   b. Demand
3. a. Making management decisions
   b. Planning buying and selling operations
4. a, c, d, e
5. a. 1
   b. 4
   c. 2
   d. 3
6. a. 3
   b. 9
   c. 1

d. 5

e. 4

f. 6

g. 11

h. 7

i. 8

j. 10

k. 2

l. 14

m. 17

n. 21

o. 13, 20

p. 16

q. 12

r. 15

s. 22

t. 18

u. 19

7. Evaluated to the satisfaction of the instructor

8. Evaluated to the satisfaction of the instructor

[redacted] Section D
Farm Business Management.

BUDGETING
UNIT I

UNIT OBJECTIVE

After completion of this unit, the student should be able to distinguish between complete and partial budgets. The student should be able to select and develop a budget that will fit a particular farming or business operation. This knowledge will be evidenced by completion of assignment sheets and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with budgeting to the correct definitions.
2. Match types of budgets to the correct uses.
3. Select from a list results of a well-planned cash flow budget.
4. Select from a list ways in which a partial budget should be used.
5. Name possible effects on net income when a change in the farm business takes place.
6. Select from a list steps to follow in developing a budget.
7. Select from a list kinds of physical data included in a budget.
8. Name methods of arriving at price estimates when preparing a budget.
9. Select from a list limitations of most budgets.
10. Select from a list reasons for budgeting.
11. Select fixed cost factors when given a list of alternatives.
12. Select operating cost factors when given a list of alternatives.
13. Calculate budgeting problems.
14. Develop a budget that fits his/her farm or business operation.

BUDGETING
UNIT I

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

   A. Provide student with objective sheet.

   B. Provide student with information and assignment sheets.

   C. Make transparencies.

   D. Discuss unit and specific objectives.

   E. Discuss information and assignment sheets.

   F. Work all assignment sheets prior to class.

   G. Have copies of OSU fact sheets on budgeting.

   H. Allow student to develop a budget for the supervisory farm training program.

   I. Develop transparencies showing fixed and operating cost factors.

   J. Have student bring calculator to class to work problems.

   K. Give test.

   L. Reteach if necessary.

II. Instructional materials:

   A. Objective sheet

   B. Information sheet

   C. Transparency masters

      1. TM 1--Partial Budget

      2. TM 2--Complete Budget

      3. TM 3--Partial Budget Form

   D. Assignment sheets

      1. Assignment Sheet #1--Calculate Budgeting Problems

      2. Assignment Sheet #2--Develop Budget for Supervised Farm Training Program

   E. Answers to assignment sheet

F. Test

G. Answers to test

III. Unit references:

A. Castle, Emery N. *Farm Business Management: The Decisionmaking Process.* New York: The Macmillan Co., 1967.

B. Schneeberger, Kenneth C., and Walker, Odell L. *Farm Management: Basic Economic Principles.* Stillwater: The Department of Agricultural Economics/Oklahoma State University, n.d.

C. *Economics for Agriculture.* Urbana, Illinois: Department of Agricultural Economics/Vocational Agriculture Service, n.d.

D. Jobes, Raleigh A. "Use of Budgets in Farm Management." *OSU Extension Facts,* no. 139. Stillwater: Oklahoma State University/Department of Agricultural Economics, n.d.

BUDGETING
UNIT I

INFORMATION SHEET

I. Terms and definitions

A. Budget--Physical and financial plan for the operation of a farm for a specific period of time

(NOTE: Budgeting is a projection of what WILL happen, in contrast to farm records which are a history of what HAS happened. Also, the budget is developed for a specific period of time.)

B. Long-term budget--Plan which may be realized after a period of change and development (more than one production year)

C. Short-term budget--Plan for the use of farm (ranch) resources for the next production period, generally the year ahead

(NOTE: The short-term budget is used to determine what short-run changes can be made to best fit the current economic or production conditions.)

D. Present normal plan--Plan which refers to the present normal organization and operation

(NOTE: The plan is a summary of crop acres and yields, livestock numbers and production, labor requirements, and income and expense items which occur under normal operation, normal weather, and normal economic conditions.)

E. Independent enterprise--Enterprise which has no relationship with other enterprises

F. Competitive enterprise--Enterprise which competes for a farmer's resources

(NOTE: When two enterprises are competitive, the production of one enterprise is reduced while the other is increased. Dairying and beef cattle are examples of competitive enterprises. They compete for land, labor, pasture, and capital.)

G. Fixed cost--Cost that occurs regardless of production

H. Operational cost--Expense incurred in operating a farm or business

(NOTE: Variable costs are used interchangeable with operational costs.)

I. Animal unit month (AUM)--Amount of pasture required for an animal per month

INFORMATION SHEET

II. Types of budgets

   A. Partial--Budget prepared for a small part of the business (Transparency 1)

      (NOTE: Changes in production such as increasing and decreasing fertilizer consumption, increasing or reducing an enterprise, and substituting capital for labor would require the making of a partial budget.)

   B. Complete--Budget prepared for the entire farming operation or business (Transparency 2)

      (NOTE: This might be referred to as a total farm budget.)

   C. Enterprise--Budget prepared for a specific agricultural enterprise

III. Cash flow budget

   A. Identifies future expenses

   B. Allows for eliminating empty spots where expense outruns income

   C. Aids in long-range farm planning

   D. Strengthens financial statement of net worth

IV. Uses of partial budget

   A. Adding to an enterprise

   B. Introducing a new enterprise

   C. Purchasing a new machine

V. Possible effects on net income when farm business changes

   A. Additional costs

   B. Reduced returns

   C. Additional returns

   D. Reduced costs

VI. Steps in developing a budget

   A. Evaluate goals and objectives

   B. Inventory the farm resources

   C. Select enterprises to be budgeted

   D. Select physical data to be used in the production process

INFORMATION SHEET

E. Select prices to apply to the physical data

F. Calculate the costs and returns

VII. Kinds of physical data included in a budget

A. Crop yields

B. Livestock feed requirements and production rates

C. Labor requirements

D. Fertilizer and spray responses

E. Fuel and oil requirements

F. Seeding responses

(NOTE: Most of the available data is generally expressed as averages of a number of observations.)

VIII. Arriving at price estimates

A. Actual prices for previous year

B. Projected price based on trends, production cycles, competition, or technology

C. Arbitrary decision of future prices

Example*:

		Partial budget		Complete budget
Long-term	1.	Average prices	1.	Average prices
	2.	Normal yields	2.	Normal yields
	3.	Receipts that change	3.	All receipts
	4.	Costs that change	4.	All costs
Short-term	1.	Current or expected prices	1.	Current or expected prices
	2.	Expected yields	2.	Expected yields
	3.	Receipts that change	3.	All receipts
	4.	Costs that change	4.	All costs

*Courtesy of Agricultural Economics Department, Oklahoma State University

(NOTE: Actual historical prices for a specified period are perhaps most commonly used in budgeting. This has merit because even though the general level of prices in the future may turn out to be different from those of the historical period, relative prices will generally be quite similar. If the budget is for one or two years, then current prices would be appropriate.)

INFORMATION SHEET

IX. Limitations of most budgets

- A. Comparisons cannot be drawn from budgets of one farm to another

  (NOTE: Budget data for a 160-acre farm can be used in budgeting a farm of 320 acres with certain differences in resources and organization that must be adequately accounted for if the end result is to be reliable.)

- B. Budgets deal with future action

  (NOTE: It is difficult to make correct estimates on future prices and yields.)

- C. Budget preparation is time-consuming

X. Reasons for budgeting

- A. Identifies items that have several years of useful life
- B. Allows for experimentation with possible outcome of organizational changes
- C. Allows manager to uncover items of cost that might be overlooked
- D. Is useful when refining present organization
- E. Is useful when seeking credit
- F. Serves as an excellent device for learning to organize

XI. Fixed cost factors (Transparency 3)

- A. Depreciation
- B. Interest
- C. Shelter
- D. Taxes
- E. Insurance

XII. Operating cost factors (Transparency 3)

- A. Fuel, oil, and grease
- B. Repairs
- C. Labor

  Example: Labor furnished by the farmer or the farmer's regular help in servicing and repairing the machinery

  (NOTE: Labor can be a fixed cost in some instances.)

- D. Seed, feed, and fertilizer

INFORMATION SHEET

XIII. Budget calculations (Assignment Sheet #1)

Problem:

You want to set up a partial budget to help decide whether it will pay you to include more roughage in the rotation and feed an additional 40 steers for which you have space, equipment, and labor. Assume that the latter items have no alternative use and therefore do not make a charge for them. The value of production (sales value - purchase value) will amount to $125 per steer, but the reduced value of grain production will amount to $1,750 for the farm. (Estimating $125 as value of production per steer is another shortcut, rather than subtracting purchase cost from sales value.) Each steer will be fed $70 worth of concentrates plus hay, which has no other use. (Since the hay would not be sold or otherwise used, do not include a value for it in the partial budget.)

Interest will amount to $10 per steer. Taxes and miscellaneous costs are estimated at $3 per head. Fertilizer costs and fuel and repair costs on machinery will be reduced by $450 as a result of the change in the cropping system. What will be the effect on the net income for the farm if you make the change?

Solution:

Additional Costs		Additional Returns	
Concentrates $70 x 40 steers	$2,800	Value of production $125 x 40 steers	$5,000
Interest $10 x 40 steers	400		
Taxes and miscellaneous $3 x 40 steers	120		
Reduced Returns		Reduced Costs	
Reduced grain production	$1,750	Fertilizer costs and fuel and repair costs on machinery	$ 450
A. Total annual additional costs and reduced returns	$5,070	B. Total annual additional returns and reduced costs	$5,450
			$5,450 - 5,070
Net change in income (B minus A)			+$ 380

Partial Budget

Additional Costs	Additional Returns
Reduced Returns	Reduced Costs
A. Total annual additional costs and reduced returns	B. Total annual additional returns and reduced costs

Net change in income (B minus A)

Complete Budget

ITEM	RECEIPTS
LIVESTOCK	
B.F. of milk	$ 4,018
Cattle	990
Hogs	2,829
Poultry or eggs	413
TOTAL I.S. RECEIPTS	$ 8,250
CROPS	
Corn	$ 140
TOTAL CROP RECEIPTS	$ 140
HOME USE	
Dairy	$ 128
Beef and veal	57
Eggs and poultry	123
TOTAL HOME USE	$ 308
TOTAL GROSS INCOME	$ 8,698

ITEM	EXPENSES
OPERATING or VARIABLE COSTS	
Livestock direct	$1,859
Crop direct	1,034
Other tractor	231
Equipment upkeep	198
Other hired labor	600
Electricity	199
Miscellaneous	325
TOTAL OPERATING EXPENSES	$4,446
FIXED EXPENSES	
Taxes	$ 220
Interest	150
Insurance	45
Improvements	314
TOTAL FIXED EXPENSES	$ 729
TOTAL EXPENSES	$5,175
NET FARM INCOME	$3,523

Partial Budget Form

100 ACRES OF MILO CUSTOM COMBINED @ $4.00 = $400.00

OWNERSHIP EXPENSES

Fixed Costs

$2450.00 (cost of combine)
- 200.00 (salvage value)
$2250.00

Depreciation - $2250.00 - 10 yrs	$225.00
Interest - 7% - 1/2 new cost (average investment)	85.75
Insurance - 0.25% of new cost	6.12
Housing - 0.75% of new cost	18.37
Total fixed cost	$335.24

Operational Costs

Repairs - 4% of new cost	$ 98.00
Fuel - 36 hrs @ $.75 per hr	27.00
Labor - 36 hrs @ $1.00 per hr	36.00
Total operational costs	$161.00

$335.24 + $161.00 = $496.24 - $400.00 (custom cost) = $96.24 or loss if combine were purchased

BUDGETING
UNIT I

ASSIGNMENT SHEET #1--CALCULATE BUDGETING PROBLEMS

PARTIAL BUDGETING

Work each of the following partial budget problems. When completed, return to instructor for evaluation.

1. A farmer is trying to maximize her time available during winter months and other slack times during the year. She is considering two changes in the farm program: (1) Increase feeder pig production by adding five sows which are expected to raise eight pigs per litter, farrowing twice a year; (2) Reduce winter calving beef cow herd by five cows. What would be the net change in income?

Data:

Additional Costs:

1. Increase grain use for sows at 72 bu/head or 360 bu/yr at $1.15 a bushel.
2. Increase pasture use for sows at 1 ton hay/head or 5 ton/yr at $12/ton.
3. Increase creep feed for pigs at 170 lbs/litter or 1700 lbs/yr at $6/cwt.
4. Increase 40% protein for pigs at 360 lbs/litter or 3600 lbs/yr at $5/cwt.
5. Increase total miscellaneous variable costs at $28.16/litter.
6. Increase labor costs @ 11 hrs/litter or 110 hrs/yr at $1.50/hr.

Reduced Returns:

1. Decrease sale of calves at 375 lbs/cow or 1875 lbs/yr at $38.25/cwt.
2. Decrease sale of cull cows at 146 lbs/cow or 730 lbs/yr at 18¢/lb.

Additional Returns:

1. Increase sale of 7.5 pigs/litter or 75 pigs/yr at $20/head.
2. Increase sale of 0.5 cull sow/litter or 5 sows/year weighing 400 lbs at $16.50/cwt.

ASSIGNMENT SHEET #1

Reduced Costs:

1. Reduce hay use for cows @ 1.3 tons/cow or 6.5 tons/year at $22/ton.
2. Reduce pasture use for cows at 11.4 AUM/cow or 57 AUM/yr at $4/AUM.
3. Reduce supplemental feed use @ 2.12 cwt/cow or 10.6 cwt/yr at $5/cwt.
4. Reduce total miscellaneous variable costs at $14.82/cow.
5. Reduce labor costs @ 7 hrs/cow or 35 hrs/yr at $1.50/hour.

PARTIAL BUDGET FORM

Situation:

Additional Costs	$	Additional Returns	$
Reduced Returns	$	Reduced Costs	$
a. Total annual additional costs and reduced returns	$________	b. Total annual additional returns and reduced costs	$________
			$________
		Net change in income (b minus a)	$________

ASSIGNMENT SHEET #1

2. You have been hiring custom combining for 80 acres of crops at $5.00 per acre. You can rent a self-propelled combine for $4.25 an acre, but you will need to furnish your own fuel, oil, and grease. You estimate that the latter charges will amount to $0.35 per acre.

Assume your labor to be worth $1.50 per hour because of other uses at this time, with 0.4 hour of labor needed per acre. You feel that you will be able to get an additional $1.00 worth of crops per acre by operating the machine yourself rather than hiring the job done by custom work.

What is the estimated effect on net income if you change from custom hiring to renting?

Additional Costs	$	Additional Returns	$
Reduced Returns	$	Reduced Costs	$
a. Total annual additional costs and reduced returns	$ ______	b. Total annual additional returns and reduced costs	$______

ASSIGNMENT SHEET #1

3. A farmer has one tractor but is considering purchasing a smaller one, along with a cultivator, because 1) his daughter, who has no alternative use for her labor, can do custom cultivating of 400 acres of corn for neighbors, and 2) the smaller tractor will be more economical for light work.

   The tractor will cost $2,800.00 and will have annual costs of 18 percent per year for the usual fixed costs plus repairs. The cultivator will cost $350.00 and will have annual costs of 16 percent of the new cost. The custom cultivating will return $1.25 per acre.

   The fuel cost for cultivating the corn will be $0.15 per acre. The small tractor will save 100 gallons of fuel annually at a price of $0.20 per gallon over the present tractor in performing light work.

   What is the estimated change in average annual net income with the new equipment?

4. Pat Hopkins produces wheat on clay soils in eastern Oklahoma.

   a. The costs for seed, machinery, and harvesting are listed below. However, the fertilizer cost, hauling cost, yield, and price received have not been calculated. Fill in the following blanks to complete the wheat enterprise budget for Pat Hopkins.

   Production Costs ($)

Seed	$ 3.38
Machinery operation	2.10
Machinery ownership	2.47
Fertilizer 150 lbs of 10-20-10 @ $3.20/cwt plus 80 lbs am. nitrate @ $3.00/cwt	____
Combining	5.00
Hauling @ $0.08/bu	____
Total production costs	____

ASSIGNMENT SHEET #1

Production and sales	
Grain 30 bu @ $1.25/bu	____
Returns to land, labor, capital, overhead, management, and risk	____
Capital charge $28.36 annual capital @ 8%	____
Returns to land, labor, overhead, management, and risk	____
Land charge (compute by same method shown in the fact sheet)	____
Labor charge 1.92 hrs @ $1.50 per hr	2.88
Returns to overhead, management, and risk	____

b. Pat Hopkins owns the land and furnishes all of the labor but uses borrowed capital to pay all operating expenses for wheat production. Using the information you developed in the above budget, you determined his owned resources are __________ per acre of wheat produced.

c. Hopkins complies with the wheat program by not overplanting the 200-acre wheat allotment. As a result, he is eligible for certificate payment of $1.38 per bushel times the normal yield per acre (30 bu) on 43% of the allotment. The returns to owned resources (including returns to grain sales and certificate payments) are __________ per acre on __________ acres and __________ per acre on the remaining __________ acres.

ASSIGNMENT SHEET #1

d. A sales representative with a commercial seed company indicates there is a variety of seed that will increase Hopkins' wheat yield 10% or 3 bu per acre. Seed cost would run $6.00 per acre for this variety. Complete the following analysis to determine the change in net returns per acre resulting from adoption of this variety.

Increased sales @ $1.25 per bu ________

Increased expenses

Seed ($6.00 - $3.38) ________

Fertilizer 20 lbs am. nitrate @ $3.00/cwt ________

Hauling @ $0.08 per bu ________

Capital (for seed and fert., $1.75 + 0.15 = $1.90) @ 0.08 x $1.90 ________

Total increased expenses ________

Difference in returns to owned resources per acre ________

BUDGETING
UNIT I

ASSIGNMENT SHEET #2--DEVELOP BUDGET FOR SUPERVISED FARM TRAINING PROGRAM

Study your individual supervised farm training program and develop the type of budget that will be needed in order to properly expand the enterprise. When completed, return to instructor for evaluation.

BUDGETING
UNIT I

ANSWERS TO ASSIGNMENT SHEET #1

1.

Additional Costs	$	Additional Returns	$
Grain for sows	414.00	Sale of pigs	1500.00
Pasture for sows	60.00	Sale of cull sows	66.00
Creep feed for sows	102.00		
Protein for pigs	180.00		
Miscellaneous	281.60		
Labor	165.00		
	$1,202.60		$1,566.00
Reduced Returns	$	Reduced Costs	$
Sale of calves	717.19	Hay for cows	143.00
Sale of cull cows	131.40	Pasture for cows	228.00
		Supplemental feed for cows	53.00
		Miscellaneous variable costs	74.10
		Labor cost	52.50
a. Total annual additional costs and reduced returns	$ 2051.19	b. Total annual additional returns and reduced costs	$ 2116.60
			-$ 2051.19

Net change in income (b minus a) $ 65.41

2.

Additional Costs		Additional Returns	
Rental charge 80 x $4.25 per acre =	$ 340	Additional crop harvested 80 x $1 per acre	$ 80
Fuel, etc. 80 x $0.35 per acre =	28		
Labor for operating combine 0.4 hr x 80 acres = 32 hr 32 x $1.50 per hour =	48		
Reduced returns		**Reduced costs**	
None	$	Custom charge 80 x $5 per acre	$ 400
a. Total annual additional costs and reduced returns	$ 416	b. Total annual additional returns and reduced costs	$ 480 -$ 416 +$ 64

Net change in income (b minus a)

3.

Additional Costs		Additional Returns	
Annual cost of new tractor $2,800 x 18% =	$ 504	Returns for custom work 400 acres @ $1.25	$ 500
Annual cost of cultivator $350 x 16% =	56		
Fuel 400 acres, $0.15 per acre	60		
Reduced returns		**Reduced costs**	
None	$	Savings in fuel by using tractor for light work 100 gal @ $0.20	$ 20
a. Total annual additional costs and reduced returns	$ 620	b. Total annual additional returns and reduced costs	$ 520 -$ 620 -$ 100

Net change in income (b minus a)

4. a.

Production costs	$
Seed	3.38
Machinery operation	2.10
Machinery ownership	2.47
Fertilizer 150 lbs of 10-20-10 @ $3.20/cwt plus 80 lbs am. nitrate @ $3.00/cwt	$2.40 + 4.80 = 7.20
Combining	5.00
Hauling @ $0.08/bu	2.40
Total production costs	22.55
Production and sales	
Grain 30 bu @ $1.25 per bu	37.50
Returns to land, labor, capital, overhead, management, and risk	14.95
Capital charge $28.36 annual capital @ 8%	2.27
Returns to land, labor, overhead, management, and risk	12.68
Land charge (compute by same method shown in the fact sheet)	10.10
Labor charge $1.92 hrs @ $1.50 per hr	2.88
Returns to overhead, management, and risk	-0.30

b\. 12.68

c\. Grain sales and certificate payments

$54.08 per acre on 86 acres

Remaining acres

$12.68 per acre on 114 acres

d. Increased sales @ $1.25 per bu		3.75
Increased expenses		
Seed ($6.00 - 3.38)	2.62	
Fertilizer 20 lbs am. nitrate @ $3.00/cwt	0.60	
Hauling @ $0.08 per bu	0.24	
Capital (for seed and fert., $1.75 + 0.15 = $1.90) @ 0.08 x $1.90	0.15	
Total increased expenses		3.61
Difference in returns to owned resources per acre		0.14

BUDGETING
UNIT I

TEST

NAME ______________________________ SCORE ______________

1. Match the terms on the right to the correct definitions.

_____a. Physical and financial plan for the operation of a farm for a specific period of time

_____b. Expense incurred in operating a farm or business

_____c. Cost that occurs regardless of production

_____d. Plan which may be realized after a period of change and development (more than one production year)

_____e. Plan for the use of farm (ranch) resources for the next production period, generally the year ahead

_____f. Plan which refers to the present normal organization and operation

_____g. Enterprise which competes for a farmer's resources

_____h. Enterprise which has no relationship with other enterprises

_____i. Amount of pasture required for an animal per month

1. Present normal plan
2. Budget
3. Operational cost
4. Long-term budget
5. Fixed cost
6. Short-term budget
7. Independent enterprise
8. Animal unit month (AUM)
9. Competitive enterprise

2. Match the types of budgets on the right to the correct uses.

_____a. Budget prepared for a small part of the business

_____b. Budget prepared for the entire farming operation or business

_____c. Budget prepared for a specific agricultural enterprise

1. Enterprise
2. Complete
3. Partial

3. Select from the list below the results of a well-planned cash flow budget. Place an "X" in the blanks provided.

______a. Reduces returns

______b. Aids in long-range farm planning

______c. Strengthens financial statement of net worth

______d. Provides inventory of farm resources

______e. Identifies future expenses

4. Select from the list below ways in which a partial budget should be used.

______a. Purchasing a new machine

______b. Selling an enterprise

______c. Introducing a new enterprise

______d. Purchasing a used ski boat

______e. Adding to an enterprise

5. Name four possible effects on net income when a change in the farm business takes place.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

6. Select from the following list steps to follow in developing a budget.

______a. Check cash flow

______b. Inventory the farm resources

______c. Select enterprises to be budgeted

______d. Use farm records

______e. Evaluate goals and objectives

______f. Calculate the costs and returns

______g. Select farmer to supply all prices

______h. Select physical data to be used in the production process

______i. Select prices to apply to the physical data

7. Select from the list below the kinds of physical data included in a budget.

_____a. Crop yields

_____b. Breeding livestock

_____c. Fuel and oil requirements

_____d. Taxes

_____e. Insurance

_____f. Fertilizer and spray responses

8. Name three methods of arriving at price estimates when preparing a budget.

a. ______________________________

b. ______________________________

c. ______________________________

9. Select from the list below the limitations of most budgets. Place an "X" in the blanks.

_____a. Budgets deal with future action

_____b. Budgets allow manager to uncover items of cost that might be overlooked

_____c. Budget preparation is time-consuming

_____d. Budgets are useful when seeking credit

_____e. Comparisons cannot be drawn from budgets of one farm to another

10. Select from the following list the reasons for budgeting.

_____a. Is useful when seeking credit

_____b. Allows manager to determine when to sell

_____c. Is useful when refining present organization

_____d. Causes manager to be disorganized

_____e. Identifies items that have several years of useful life

_____f. Allows for experimentation with possible outcome of organizational changes

_____g. Allows manager to cover up items of hidden cost

11. Select fixed cost factors from the list below.

______a. Fuel, oil, and grease

______b. Interest

______c. Taxes

______d. Repairs

______e. Depreciation

______f. Labor

12. Select operating cost factors from the list below.

______a. Shelter

______b. Repairs

______c. Depreciation

______d. Labor

______e. Interest

______f. Fuel, oil, and grease

13. Calculate the following partial budgeting problem.

A farmer is trying to maximize her profits. She has been hiring custom combining for 65 acres of milo at $6.50 per acre. She can rent a self-propelled combine for $5.00 an acre, but will need to furnish own fuel, oil, and grease. The farmer estimates that the latter charges will amount to $0.65 per acre.

Assume her labor to be worth $2.65 per hour because of other uses at this time, with 0.5 hour of labor needed per acre. The farmer feels that she will be able to get an additional $2.00 worth of milo per acre by operating the machine herself rather than hiring the job done by custom work.

What is the estimated effect on net income if she changes from custom hiring to renting?

Additional Costs $	Additional Returns $

Reduced Returns	$	Reduced Costs	$
a. Total annual additional costs and reduced returns	$ ______	b. Total annual additional returns and reduced costs	$ ______

14. Develop a budget that fits your farm or business operation.

(NOTE: If this activity has not been accomplished prior to the test, ask the instructor when it should be completed.)

BUDGETING
UNIT I

ANSWERS TO TEST

1. a. 2
   b. 3
   c. 5
   d. 4
   e. 6
   f. 1
   g. 9
   h. 7
   i. 8
2. a. 3
   b. 2
   c. 1
3. b, c, e
4. a, c, e
5. a. Additional costs
   b. Reduced returns
   c. Additional returns
   d. Reduced costs
6. b, c, e, f, h, i
7. a, c, f
8. a. Actual prices for previous year
   b. Projected price based on trends, production cycles, competition, or technology
   c. Arbitrary decision of future prices
9. a, c, e
10. a, c, e, f

11. b, c, e

12. b, d, f

13. Additional Costs

Rental charge
65 × $5.00 per acre = $325.00

Fuel, etc.
65 × $0.65 per acre = 42.25

Labor for operating combine
0.5 hr × 65 acres = 32.5 hrs
32.5 × $2.65 per hr = 86.13

Reduced Returns

None $

a. Total annual additional costs and reduced returns $453.38

Additional Returns

Additional milo harvested
65 × $2.00 per acre = $130.00

Reduced Costs

Custom combining
65 × $6.50 per acre = $422.50

b. Total annual additional returns and reduced costs

Net change in income
$552.50
-453.38
+ 99.12

14. Evaluated to the satisfaction of the instructor

ACQUISITION OF FARMLAND
UNIT II

UNIT OBJECTIVE

After completion of this unit, the student should be able to select the most profitable and economical means of acquiring farmland. The student should be able to manage farm practices in order to protect own rights as either a tenant or a landowner and be able to select advantages and disadvantages of the different forms of business arrangements. This knowledge will be evidenced by completion of assignment sheets and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with the acquisition of land to the correct definitions.
2. Name the most profitable ways of operating a farm before securing enough capital for purchase.
3. Select from a list advantages of owning land compared to leasing.
4. Match methods of leasing land to the correct definitions.
5. Select from a list factors to consider when leasing land.
6. Name ways of determining equitable rent.
7. Distinguish between landowner's and tenant's responsibilities for farm practices.
8. Select from a list what you should look for when purchasing a farm or additional farmland.
9. List questions to ask before expanding the operation by purchasing additional farmland.
10. Select the standard rate of rent for cropland and pastureland for local community.
11. Calculate leasing rates.
12. Complete a lease agreement.
13. Appraise land.

ACQUISITION OF FARMLAND
UNIT II

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

  A. Provide student with objective sheet.

  B. Provide student with information and assignment sheets.

  C. Discuss unit and specific objectives.

  D. Discuss information and assignment sheets.

  E. Ask a local realtor to act as resource person and speak on do's and don'ts of purchasing land.

  F. Have student appraise home farm.

  G. Have student survey community for rental rates and complete Assignment Sheet #1.

  H. Have student do a partial budget on purchasing more farmland.

  I. Take student to county treasurer's office to look up taxes on home farm.

  J. Obtain plat book for student to look up home farm boundaries and number of acres.

  K. Have student complete lease agreement.

  L. Give test.

  M. Reteach if necessary.

II. Instructional materials:

  A. Objective sheet

  B. Information sheet

  C. Assignment sheets

    1. Assignment Sheet #1--Select Standard Rate of Rent for Cropland and Pastureland for Local Community

    2. Assignment Sheet #2--Calculate Leasing Rates

    3. Assignment Sheet #3--Complete a Lease Agreement

    4. Assignment Sheet #4--Appraise Land

D. Answers to Assignment Sheet #2

E. Test

F. Answers to test

III. Unit references:

A. Castle, Emery N., and Becker, Manning H. *Farm Business Management.* New York: The Macmillan Co., 1967.

B. Hall, Isaac Fults, and Mortenson, William Peter. *The Farm Management Handbook.* Danville, Illinois: The Interstate Printers and Publishers, Inc., 1963.

C. Hamilton, James E., and Bryant, W. R. *Profitable Farm Management.* Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1963.

D. Badger, Daniel D., and Jeffrey, D. B. "Land Leasing Arrangements." *OSU Extension Facts,* no. 120. Stillwater: Department of Agricultural Economics/Oklahoma State University, 1966.

E. Maynard, Cecil D. "Types of Farm Business Organizations." *OSU Extension Facts,* no. 122. Stillwater: Department of Agricultural Economics/Oklahoma State University, 1974.

F. Davis, K. C.; Maynard, Cecil D.; and Jeffrey, D. B. "The Oklahoma Farm Lease Agreement." *OSU Extension Facts,* no. 121. Stillwater: Department of Agricultural Economics/Oklahoma State University, 1974.

G. Maynard, Cecil D., and Laughlin, Glenn L. *Farm Partnerships.* Circ. E-710. Stillwater: Department of Agricultural Economics/Oklahoma State University, n.d.

H. Maynard, Cecil D., and Laughlin, Glenn L. *The Oklahoma Farm Ranch Corporation.* Circ. E-184. Stillwater: Department of Agricultural Economics/Oklahoma State University, n.d.

ACQUISITION OF FARMLAND
UNIT II

INFORMATION SHEET

I. Terms and definitions

   A. Capital--Money or assets needed to operate business

   B. Written lease--Agreement between two parties or individuals concerned with the essential conditions of leasing and operating a farm

   C. Lessor--Individual or organization that leases a piece of property or business to an outside individual or firm

   D. Tenant--Individual who is either renting or leasing and operating property from some other individual

   E. Landowner--Individual who owns property and is leasing the property to the tenant

   F. Levy--Assessment, tax, fine

   G. Plat--Map or description of property

   H. Escrow--Money paid down to purchase land and held by a third person such as a bank or real estate company

   I. Acquisition--Purchase

II. Ways of operating farm before purchase

   A. Family partnership

   B. Leasing

III. Advantages of owning land

   A. Opportunity to enjoy windfall gains

   B. Owner will benefit if land prices rise

   C. More stabilized farming program can be planned

   D. Owner can expand and contract operations easier

IV. Leasing land

   A. Cash rent--Agreement whereby the tenant pays a fixed cost for property regardless of the type or yield of the crop being produced

   (NOTE: Cash rent leases are preferred by commercial farmers.)

INFORMATION SHEET

B. Crop share--Agreement between the landowner and the tenant whereby the lease is paid based on a percentage of the crop yield

(NOTE: This leasing rate varies according to crops and the location within the state. Cash-crop farms frequently are rented for one-third of the grain or one-fourth of the cotton. No definite pattern of rental practices has been established for legumes because too many variable factors are involved. It is important to note that the lease farm does not call for a specific number of crop acres. The word *approximate* is used.)

Example:

You were leasing forty acres of wheat which had a yield of forty bushels per acre. Wheat at harvesttime was bringing $1.30 per bushel. All the landowner contributed was the land and you agreed to give him 1/3 of the yield. What would be the landowner's share in dollars according to such an agreement?

$$\frac{\text{Number of acres x yield per acre x price per bushel}}{\text{landowner's percent of yield}} = \begin{array}{l}\text{Landowner's}\\ \text{share in}\\ \text{dollars}\end{array}$$

40 acres x 40 bushels per acre = 1,600 bushels of wheat

1,600 bushels of wheat x $1.30 per bushel = $2,080.00

$2,080.00 ÷ 1/3 = $693.33 landowner's share

C. Livestock share--Agreement between the landowner and tenant whereby the landowner furnishes one-third of the cattle and the tenant furnishes two-thirds of the cattle

(NOTE: The livestock agreement for wheat pasture generally follows the pattern of the crop share leases; that is, the landowner is furnishing one-third of the basic livestock and the tenant is furnishing two-thirds. In a livestock agreement, the increase is divided on the same basis as contribution. The ownership of the livestock is on an undivided basis and should remain that way throughout the lease.)

D. Fixed product rent--Agreement whereby the tenant pays landowner a cash price determined by multiplying present prices times a share of the long-term yield

E. Profit sharing--Agreement whereby the landowner and the tenant specify in advance what each will furnish and also agree upon the division of the profits

INFORMATION SHEET

V. Factors to consider when leasing land

   A. Productivity of land

   B. Location of land in regard to farming headquarters

   C. Government controls, if any

   D. Cropping history

   E. Management history

   F. Identification of leasing rates

      1. Variable costs shared according to each contribution

         (NOTE: Alfalfa will respond to top dressing with phosphate, the recommended amount costing $3.00. Gross income will increase by $5.00. The rental arrangements specify that the tenant must furnish the fertilizer. From $3.00 spent by the tenant for fertilizer, an additional $5.00 worth of alfalfa is produced. If the tenant is renting on a 50-50 basis, she will have spent $3.00 and received $2.50; the landowner will receive a net of $2.50. Under this arrangement, if the tenant were to divide the cost of fertilizer in the same proportion as the crop, each would furnish a $1.50 worth of phosphate and receive a gross return of $2.50.)

      2. Return on each enterprise shared in same proportion

         (NOTE: The tenant rents alfalfa on a 50-50 basis and peanuts on a 1/4-3/4 basis. He may have an incentive to devote more of the farm resources to peanuts because it pays the greatest returns to the tenant for added input. The landowner may prefer more resources be used to produce alfalfa as alfalfa returns her more income.)

      3. Allowance for returns on investments

         (NOTE: Many tenants make improvements through conservation practices which may not increase the annual income of the farm but contribute to the overall value of the farm.)

   G. Length of lease

      Examples: Beginning date of the lease; notice of termination; means of renewing the lease; ways of cancelling lease

INFORMATION SHEET

VI. Determining equitable rent

A. Set share arrangement in advance

B. Total fixed inputs and identify proportion contributed by each party

VII. Adjusting crop share leases

Practice	Landowner's Share	Tenant's Share
Fertilizer to establish yield of area at beginning of lease	X	
Established yield of area is present	X 50% cost	X 50% cost
Lime	X 50% cost	X 50% cost
Weed control		X
Insecticides	X Varies 1/3 to 2/5 of cost	X Varies 2/3 to 3/5 of cost
Harvesting cost	X Varies	X
Soil conservation improvements	X	
Soil conservation improvement repairs		X
Farm improvements	X	
Government payments	X Shared as income and expenses	X
Salvaging low-grade crops	Shared as income and expenses	

INFORMATION SHEET

VIII. Purchasing farm or additional land

- A. Shop around
- B. Secure reliable realtor
- C. Take a look at neighborhood in general
- D. Secure aerial photo of farm
- E. Check on allotments and base acreages
- F. Check courthouse records
    - 1. Determine amount of taxes being paid
    - 2. Determine if special levies are against property
    - 3. Check plat book for boundaries and number of acres
    - 4. Identify what mortgages are recorded against farm
    - 5. Check on important water and mineral rights
- G. Inspect home, buildings, fences, and other improvements
- H. Have property appraised
- I. Make final checks of title, abstract, and amount of needed escrow before purchase

IX. Questions to ask before expanding operation

- A. Has net income been increasing?
- B. Are resources available to operate the additional land?
- C. Can farm support additional long-term debt?
- D. Is there enough operating capital available?
- E. What are the potential returns?

ACQUISITION OF FARMLAND
UNIT II

ASSIGNMENT SHEET #1--SELECT STANDARD RATE OF RENT FOR CROPLAND AND PASTURELAND FOR LOCAL COMMUNITY

Which of the following is considered to be the average rate of rent for each of the given crops grown in your local community? Place an "X" in the blank if the statement indicates the average rate of your community. Refer to the Landowner's Share and Contributing Factors chart.

1. Wheat

   _____ 1/3 of crop when landowner pays 1/3 of fertilizer and insecticide costs

   _____ 1/2 of crop when landowner pays for all the seed and 1/2 of fertilizer and insecticide costs

2. Soybeans

   _____ 1/3 of crop when landowner pays 1/3 of fertilizer and insecticide costs

   _____ 1/2 of crop when landowner contributes only the land

3. Corn

   _____ 1/2 of crop when landowner contributes 1/3 of fertilizer and insecticide costs

   _____ 1/3 of crop when landowner contributes 1/3 of fertilizer and insecticide costs

4. Grain sorghum

   _____ 1/3 of crop when landowner contributes 1/3 of fertilizer and insecticide costs

   _____ 1/3 of crop when landowner contributes only the land

5. Cotton

   _____ 1/2 of crop when landowner contributes 1/4 of fertilizer, insecticide, and harvesting costs

   _____ 1/4 of crop when landowner contributes 1/4 of fertilizer, insecticide, and harvesting costs

ASSIGNMENT SHEET #1

6. Hay (prairie)

_____ 1/3 of crop when landowner contributes only the land when hay is sold in the field

_____ 1/2 of crop when landowner contributes only the land when hay is sold in the field

7. Peanuts

_____ 1/2 of crop under dryland conditions when landowner contributes 1/4 of fertilizer, insecticide, and harvesting costs

_____ 1/4 of crop under dryland conditions when landowner contributes 1/4 of fertilizer, insecticide, and harvesting costs

8. Improved pastures

_____ Rents from $10 to $20 per acre

_____ Rents from $5 to $10 per acre

_____ Other rates

9. Native pastures

_____ Rents from $1 to $6 per acre

_____ Rents from $6 to $10 per acre

_____ Other rates

Landowner's Share and Contributing Factors

Crop	Share of Crops*	Equip. Furn.	Seed	Fertilizer	Insecticide	Fuel	Labor	Harvest and Prod.	Comments	Percent Practiced
Wheat	1/3	0	0	1/3	1/3	0	0	0	Customary all areas.	80- 90
Wheat	2/5	0	0	2/5	2/5	0	0	0	Usually paid by established operators, for additional acreage. Increasing	0- 15
Wheat	1/2	0	all	1/2	1/2	0	0	1/2	Mostly Northwest. Owner usually has a 50/50 cattle operation.	2- 3
Soybeans	1/3[1]	0	0	1/3	1/3	0	0	0	East side of state.	80- 90
Barley	1/3	0	0	1/3	1/3	0	0	0	Customary all areas	80- 90
Corn	1/3	0	0	1/3	1/3	0	0	0	All areas	90-100
Cotton	1/4	0	0	1/4	1/4	0	0	1/4 gin	All areas	70- 80
Cotton	1/3	0	0	1/3	1/3	0	0	1/3 gin	Limited to highly mechanized areas. Not increasing	10- 20
Grain Sorghum	1/3	0	0	1/3	1/3	0	0	0	All areas.	80- 90
Sorghum	1/3	0	0	1/3	1/3	0	0	1/3 Comb	Eastern half. Decreasing	0- 10
Hay Prairie	1/3	0	0	0	0	0	0	0	All areas. Hay stored in barn	20- 30
Hay Prairie	1/2	0	0	0	0	0	0	0	All areas. Hay sold in the field	65- 75
Alfalfa & Seed	1/3	0	0	all lime 1/3 phosphate	1/3	0	0	all storage	All areas when establishing stands with long term leases	60- 70
Alfalfa & Seed	1/2	0	all	all	1/2	0	1/2[2]	all storage	Western half. Hay stored in barn	10- 20
Peanuts	1/4	0	0	1/4	1/4	0	0	1/4[3]	Dryland all areas	80- 90
Peanuts	1/5	0	0	0	0	0	0	0	Dryland all areas	0- 10
Peanuts	2/5	0	0	2/5	2/5	0	0	2/5[3]	Irrigation water, pump, & motor furnished. All areas	75
Peanuts	1/2	0	0	1/2	1/2	0	0	1/2[3]	Irrigation system furnished. Increasing. All areas	10
Peanuts	1/3	0	0	0	0	0	0	0[4]	Irrigation system not furnished. All areas	5
Peanuts	1/4	0	0	0	0	0	0	0	Irrigation system not furnished. All areas	10

Improved pasture--usually rents from $5 to $10 per acre; or $20 to $24 per grazing season, per head

Native pasture--usually rents from $1 to $6 per acre; or $30 to $45 per year, per head

(NOTE: The following information plays a vital part in the arrangement of crop share agreements. Landowners pay for same share of sacks, combining, drying, and hauling as they share in the crops. Most tenants west of US 77 pay for hauling all peanuts to market. Landowners pay for hauling their share on the east side of US 77. Landowners pay for their share of the drying. Government certificates are shared as rent is shared.)

The above information was taken from "Land Leasing Arrangements," OSU Extension Facts, no. 120.

ACQUISITION OF FARMLAND
UNIT II

ASSIGNMENT SHEET #2--CALCULATE LEASING RATES

Work each of the following problems concerned with leasing arrangements. When completed, return to instructor for evaluation.

1. Suppose you were a tenant and farming 160 acres of wheat land. The wheat yielded 40 bushels per acre and the selling price is $1.30 at harvesttime. What would be landowner's share of the receipts if you were using the crop share arrangement of 1/3 of the yield? The cost of the fertilizer was $7.00 per acre and was split on a 50-50 basis.

2. Suppose you were farming 200 acres of wheat which had a yield of 30 bushels per acre. The wheat at harvesttime was selling for $1.20 per bushel. Over the last few years a yield of 38 bushels per acre has been established. The agreement of payment was 1/3 of the fixed product rate. The only thing the landowner contributed was the land. What would be the landowner's share using this rate?

ASSIGNMENT SHEET #2

3. Suppose you were farming 80 acres of wheat land as a tenant farmer. You agreed on the crop share payment method of 1/3 of the yield. The landowner agreed to pay one-half of the fertilizer cost which will run $7.00 per acre and also agreed to pay half of the harvest and trucking cost which is $6.00 per acre. The yield per acre was 45 bushels and at harvesttime the wheat was selling for $1.43 per bushel. What will be the landowner's share based on 1/3 of the yield?

ACQUISITION OF FARMLAND
UNIT II

ASSIGNMENT SHEET #3--COMPLETE A LEASE AGREEMENT

OKLAHOMA FARM LEASE AGREEMENT

I. NAMES OF PARTIES AND DESCRIPTION OF PROPERTY

This lease is entered into this ________ day of ____________________, 19____, between ____________________, landlord, of ____________________ ADDRESS

and ____________________, tenant, of ____________________ ADDRESS

hereinafter called the landlord and tenant respectively, under the terms and conditions that follow, a farm of approximately ______ acres, situated in ____________ county, Oklahoma, and described as follows:

II. TERM OF LEASE

The term of this lease shall be ______ year (s) from ____________ MONTH ______ DAY, 19____,

to ____________ MONTH ______ DAY, 19____, and this lease shall continue in effect from year to year thereafter until written notice of termination is given by either party to the other on or before the ______ DAY

day of ____________ MONTH before the expiration of this lease or any renewal thereof.

III. RENTAL RATES AND ARRANGEMENTS (Options not applicable to be stricken)

Option A. *Crop Share Rent*

As rent the tenant agrees to pay or give shares or quantities of the following crops:

Crop	Approximate No. Acres	Landlord's share	Tenant's share	Distribution of landlord's share
1.				
2.				
3.				
4.				

Option B. *Livestock Share Rent*

As rent the tenant agrees to pay or give shares or quantities of the following livestock:

Kind	Approximate No. to be kept on farm	Landlord's share	Tenant's share	Distribution of Increase
1.				
2.				
3.				
4.				
Note:				

Option C. *Cash Rent*

As rent or partial rent for the farm, the tenant agrees to pay the total sum of ____________ dollars ($__________) per year. Cash rent will be paid at (place) ____________, ____________,

and as follows: (time) ____________________.

54-D

ASSIGNMENT SHEET #3

IV. FARM OPERATION.

A. The necessary equipment shall be furnished and farm operating expenses divided between the landlord and tenant as follows:

Equipment	Furnished by Landlord	Furnished by Tenant	Operating Expenses	Proportionate Share Landlord	Proportionate Share Tenant
All Equipment			All Operating Expenses		
Exceptions			Exceptions		

Note: ____________________

V. CONSERVATION AND IMPROVED FARMING PRACTICES:

A. *Soil Conservation District Plan for Farm.* The farm is covered in a Cooperative agreement between the landlord and the ____________________ Soil Conservation District, and the tenant agrees to operate the farm in accordance with the complete soil conservation and land use prepared under the said cooperative agreement.

B. *Conservation and/or other practices.* Payments which can be earned by participation in the Government Farm Programs shall be carried out as follows:

Practice and Extent	*Contributions* Landlord	*Contributions* Tenant	*Share of Government Payments* Landlord	*Share of Government Payments* Tenant
1.				
2.				
3.				
4.				

C. *Other Improved Practices:* Other improved farming practices which the landlord and tenant agree will be mutually beneficial to both parties:

Practices and Extent	Contributions by landlord
1.	
2.	
3.	
4.	

VI. IMPROVEMENTS AND REPAIRS

A. The landlord agrees to furnish materials for normal maintenance and repairs to maintain the farm in its customary condition. The tenant will furnish ordinary labor and haul the materials for these repairs, it being mutually agreed that skilled labor will be provided by the landlord.

B. Additional major improvements to be provided by the landlord are as follows:

Kind	Date

C. Construction and Removal of Fixtures by Tenant: With the written consent of the landlord, the tenant may add improvements at his own expense. He shall have the right to remove them even though they are legally fixtures, but shall have no right to compensation for them except as mutually agreed.

D. Compensation to Tenant for Unexhausted Value of Improvements: In event of termination of this lease, the tenant shall be entitled to payment for the unexhausted value of his contribution to the cost of improvements made with the consent of the landlord according to the following schedule:

ASSIGNMENT SHEET #3

Proportion remaining unexhausted after:

Improvement	1 Year	2 Years	3 Years	4 Years	5 Years
Rock Phosphate					
Ground Limestone					
Terraces					

VII. RECORDS.

Records on all matters of joint interest shall be kept by the tenant and shall be available to the landlord upon request. The records shall specify the following items:

A. ______________________ C. ______________________

B. ______________________ D. ______________________

VII. NONPARTNERSHIP AGREEMENT

This lease does not give rise to a partnership. Neither party shall have authority to bind the other without written consent.

IX. RIGHT OF ENTRY.

The landlord shall have the right in person or by agent, to enter upon the farm for inspections, repairs, or improvements. In case this lease is not to be renewed, the landlord or the incoming tenant shall have the right before it expires to do plowing or other work on the farm when doing so will cause no damage or interference to the present tenant.

X. ARBITRATION.

If parties to this lease cannot reach an agreement on any matter, or problem, the question shall be submitted to an Arbitration Committee. This committee shall be composed of three disinterested persons, one selected by each party hereto and the third by the two thus selected.

XI. IT IS MUTUALLY AGREED THAT

(a) This lease shall bind and shall inure to the benefits of the heirs, executors, administrators, and assigns of both parties.

(b) If either party willfully neglects or refuses to carry out any material provision, the other party shall have the right, in addition to compensation for damage, to terminate the lease. He shall do so by written notice on the party at fault, specifying the violations of the agreement. If violations are not corrected within 30 days, the lease shall be terminated.

XII. ADDITIONAL AGREEMENTS AND MODIFICATIONS:

Any additions to this contract or changes therein shall be in writing, and when so signed and executed before witnesses and attached hereto shall become a part hereof.

XIII. In testimony whereof witness our hands at ______________________, Oklahoma, on this __________

day of ______________________, 19_____ A. D.

Witnesses as to both signatures,

______________________ ______________________ (Seal)
(Landlord)

______________________ ______________________ (Seal)
(Tenant)

ASSIGNMENT SHEET #3

BETWEEN

____
(Landlord)

____
(Tenant)

For ____________________
(Common name or number of farm)

In ____________________ County

State of ____________________

EFFECTIVE

From ____________________, 19____

To ____________________, 19____

Renewed ____________________, 19____

From ____________________, 19____

To ____________________, 19____

Lease Form Prepared by
Department of Agricultural Economics
Oklahoma State University
Stillwater, Oklahoma

(NOTE: The Curriculum and Instructional Materials Center realizes the preceding lease agreement is discriminatory and will make every effort to encourage the Department of Agricultural Economics to modify it.)

ACQUISITION OF FARMLAND
UNIT II

ASSIGNMENT SHEET #4--APPRAISE LAND

Suppose you were planning on becoming established in farming or planning on expanding your operation by the purchase of additional property. Identify property that is for sale in your local community and complete the questions and statements listed below. When completed, return to instructor for discussion purposes and for evaluation.

Property:

Cropland ______________________ Pastureland ______________

Owner ______________________ Location ______________

Approximate number of acres ________

Asking price per acre ___________ Total dollars ______________

Being sold by owner ____ or by realtor ____ If realtor, name of firm

______________________ Office location ____________

Improvements:	Good	Fair	Poor
Home	____	____	____
Barns	____	____	____
Fences	____	____	____
Corrals	____	____	____
Soil conservation improvements	____	____	____

Amount of taxes being paid __________

Percent of mineral rights __________

Financing available ________ Firm ____________ Rate of interest ____

Years to repay loan ______________

Appraised value ________________

Discuss in a short paragraph the overall opinion of the property. In the discussion, be sure to mention whether or not the property is worth the asking price.

ACQUISITION OF FARMLAND
UNIT II

ANSWERS TO ASSIGNMENT SHEET #2

1. $2,213.33
2. $3,040.00
3. $1,196.00

ACQUISITION OF FARMLAND
UNIT II

TEST

NAME ________________________________ SCORE ____________________

1. Match the terms on the right to the correct definitions.

_____a. Individual who owns property and is leasing the property to the tenant

_____b. Money or assets needed to operate a business

_____c. Individual or organization that leases a piece of property or business to an outside individual or firm

_____d. Individual who is either renting or leasing and operating property from some other individual

_____e. Agreement between two parties or individuals concerned with the essential conditions of leasing and operating a farm

_____f. Assessment, tax, fine

_____g. Map or description of property

_____h. Money paid down to purchase land and held by a third person such as a bank or real estate company

_____i. Purchase

1. Capital
2. Written lease
3. Lessor
4. Tenant
5. Landowner
6. Acquisition
7. Levy
8. Plat
9. Escrow

2. Name two of the most profitable ways of operating a farm before securing enough capital for purchase.

a. ____

b. ____

3. Select from the following list advantages of owning land compared to leasing.

_____a. Less need of capital to start into farming

_____b. Owner can expand and contract operations easier

_____c. Opportunity to lower taxes

_____d. Owner will benefit if land prices rise

_____e. More stabilized farming program can be planned

_____f. Opportunity to enjoy windfall gains

4. Match methods of leasing land to the correct definitions.

_____a. Agreement between the landowner and tenant whereby the lease is paid based on a percentage of the crop yield

_____b. Agreement whereby the landowner and tenant specify in advance what each will furnish and also agree upon the division of the profits

_____c. Agreement whereby the tenant pays a fixed cost for property regardless of the type or yield of the crop being produced

_____d. Agreement between the landowner and tenant whereby the landowner furnishes one-third of the cattle and the tenant furnishes two-thirds of the cattle

_____e. Agreement whereby the tenant pays the landowner a cash price determined by multiplying present prices times a share of the long-term yield

1. Cash rent
2. Crop share
3. Livestock share
4. Fixed product rent
5. Profit sharing

5. Select from the following list factors to consider when leasing land.

_____a. Length of lease

_____b. Cropping history of home farm

_____c. Government controls, if any

_____d. Location of land in regard to school farm

_____e. Productivity of land

_____f. Identification of leasing rates

6. Name two ways of determining equitable rent.

   a. ____

   b. ____

7. Distinguish between responsibilities of the landowner (L) and the tenant (T) by placing the correct letter in the blanks provided. (Some of the practices may be the responsibilities of both parties.)

   ______a. Application of agricultural lime

   ______b. Application of fertilizer to establish yield of area at beginning of lease

   ______c. Harvesting cost

   ______d. Farm improvements

   ______e. Salvaging low-grade crops

   ______f. Soil conservation improvement repairs

   ______g. Weed control

   ______h. Insecticides

   ______i. Government payments

8. Select from the following list what you should look for when purchasing a farm or additional farmland.

   ______a. Have property appraised

   ______b. Check courthouse records

   ______c. Secure unreliable realtor

   ______d. Buy first farm that you see

   ______e. Inspect home, buildings, fences, and other improvements

   ______f. Take a look at neighborhood in general

9. List three questions to ask before expanding the operation by purchasing additional farmland.

   a. ____

   b. ____

   c. ____

10. Select the standard rate of rent for cropland and pastureland for your community.

11. Calculate the leasing rate in the following problem.

Suppose you were farming 60 acres of wheat on a 1/3 crop share basis. The yield of the wheat crop was 38 bushels per acre and the price was $1.44 per bushel. The landowner agreed to pay 1/3 of the fertilizer cost which was $6.00 per acre.

12. Complete a lease agreement.

13. Appraise land.

(NOTE: If activities 10-13 have not been accomplished prior to the test, ask the instructor when they should be completed.)

ACQUISITION OF FARMLAND
UNIT II

ANSWERS TO TEST

1. a. 5
   b. 1
   c. 3
   d. 4
   e. 2
   f. 7
   g. 8
   h. 9
   i. 6

2. a. Family partnership
   b. Leasing

3. b, d, e, f

4. a. 2
   b. 5
   c. 1
   d. 3
   e. 4

5. a, c, e, f

6. a. Set share arrangement in advance
   b. Total fixed inputs and identify proportion contributed by each party

7. a. L, T
   b. L
   c. L, T
   d. L
   e. L, T
   f. T
   g. T
   h. L, T
   i. L, T

8. a, b, e, f
9. Any three of the following:
    a. Has net income been increasing?
    b. Are resources available to operate the additional land?
    c. Can farm support additional long-term debt?
    d. Is there enough operating capital available?
    e. What are the potential returns?
10. Evaluated to satisfaction of instructor
11. $974.40
12. Evaluated to satisfaction of instructor
13. Evaluated to satisfaction of instructor

TYPES OF FARM BUSINESSES
UNIT III

UNIT OBJECTIVE

After completion of this unit, the student should be able to distinguish between advantages and disadvantages of the different forms of business ownerships. The student should be able to select from a list guidelines for selecting a business partner and form a partnership with another student. This knowledge will be evidenced by completion of assignment sheets and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match the basic forms of business ownerships to the correct definitions.
2. Distinguish between advantages and disadvantages of a sole proprietorship.
3. Distinguish between advantages and disadvantages of a partnership.
4. Distinguish between advantages and disadvantages of a corporation.
5. Select from a list guidelines for selecting a business partner(s).
6. Select from a list the information needed in a contract of co-partnership.
7. Distinguish between correct and incorrect statements concerning how a corporation is organized and operated.
8. Form a partnership with another student.

TYPES OF FARM BUSINESSES
UNIT III

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

  A. Provide student with objective sheet.

  B. Provide student with information and assignment sheets.

  C. Discuss unit and specific objectives.

  D. Discuss information and assignment sheets.

  E. Have student form partnership with another student.

  F. Have local lawyer speak on advantages and disadvantages of sole proprietorships, partnerships, and corporations as related to the farm business.

  G. Have student evaluate home farm and decide which form of farm business would be best suited.

  H. Give test.

  I. Reteach if necessary.

II. Instructional materials:

  A. Objective sheet

  B. Information sheet

  C. Assignment Sheet #1--Form a Partnership

  D. Test

  E. Answers to test

III. Unit references:

  A. Maynard, Cecil D. "Types of Farm Business Organizations." *OSU Extension Facts.* Stillwater: Department of Agricultural Economics/Oklahoma State University, n.d.

  B. Maynard, Cecil D., and Laughlin, Glenn L. "Farm Partnership." *OSU Extension Facts*, Circ E710. Stillwater: Department of Agricultural Economics/Oklahoma State University, n.d.

  C. Maynard, Cecil D., and Laughlin, Glenn L. "The Oklahoma Farm Ranch Corporation." *OSU Extension Facts*, Circ. E184. Stillwater: Department of Agricultural Economics/Oklahoma State University, n.d.

TYPES OF FARM BUSINESSES
UNIT III

INFORMATION SHEET

I. Forms of business ownerships

   A. Sole proprietorship--Business owned and managed by one person

   B. Partnership--Business owned by two or more persons

      (NOTE: In this form of ownership, a partnership agreement is usually written which states the amount of resources that each partner is to contribute to the firm.)

   C. Corporation--Organization which is authorized by law to act as a single person although it is made up of one or more persons

II. Sole proprietorship as a form of business ownership

   A. Advantages

      1. Easy to organize and terminate

      2. Freedom of action

         (NOTE: Owner is own boss and can act quickly in decision-making.)

      3. No sharing of profits

      4. Few government regulations

      5. Low taxes

         (NOTE: Profits are taxed as personal income.)

      6. Personal pride of ownership

   B. Disadvantages

      1. Difficulty of raising capital

      2. Lack of assistance in business operations

         (NOTE: Owner may lack the special skills and abilities needed to operate the business effectively.)

      3. Unlimited liability

      4. Uncertain future

INFORMATION SHEET

III. Partnership as a form of business ownership

A. Advantages

1. Division of responsibilities
2. Goodwill of each partner
3. Combination of skills
4. Increased sources of capital
5. Easier to obtain credit
6. Relatively easy to organize
7. Little government control
8. Low taxes
9. Operating economics

B. Disadvantages

1. Unlimited liability
2. Bound by contracts of other partners
3. Sharing of profits
4. Possibility of disagreement
5. Risk of liquidation
6. Limited expansion and capital available

IV. Corporation as a form of business ownership

A. Advantages

1. Limited liability
2. Only designated officers can make contracts
3. Variety of skills, abilities, and ideas
4. Ownership easily transferred
5. Separation of ownership and management

INFORMATION SHEET

B. Disadvantages

  1. Complicated and costly to organize
  2. High taxes and operating expenses
  3. Sharing of profits
  4. No freedom of action
  5. Separation of ownership and management

     (NOTE: There is no substitute for good legal advice and only a lawyer is qualified to give such advice. Please consult your lawyer about all legal problems.)

V. Guidelines for selecting a business partner(s)

  A. Make sure your personalities are compatible
  B. Select partner who is strong in those areas in which you are weak
  C. Select partner willing to devote time to this one business interest
  D. Make sure both of you are in agreement as to how business should be operated

VI. Information needed in a contract of co-partnership

  A. Date
  B. Names of all partners
  C. Nature of the business
  D. Name and location of business
  E. Duration of agreement
  F. Investment of each partner
  G. Sharing of profits and losses
  H. Accounts of business
  I. Partners' wages
  J. Duties of partners
  K. Restraints of partners

INFORMATION SHEET

VII. Organizing and operating a corporation

A. Ownership is divided into parts of capital stock called *shares*

B. Stockholders own the business

C. Stockholders elect board of directors

D. Directors formulate policies, set goals, and appoint officers

E. Officers in small corporation consist of president, secretary, and treasurer

F. Officers manage the corporation business

G. Officers may employ additional persons to operate the business, if needed

TYPES OF FARM BUSINESSES
UNIT III

ASSIGNMENT SHEET #1--FORM A PARTNERSHIP

A partnership must provide the following information to each party:

Name of the business

How much each party will invest

How much each party will draw in the form of a salary

How profit and losses will be shared after salaries are paid in proportion to each party's investment

What each party will be responsible for in the business

Examples: Sales, selection and purchase of merchandise, payroll, records, and maintenance

That one party has the right to purchase the departing partner's share of the business

Pair off with another student and provide the following information about your partnership:

1. Date--________________________________
2. Name and location of business--________________________
   ____
3. Nature of the business--____________________________
   ____
4. Duration of agreement--____________________________
   ____
5. Total dollars invested by each partner--__________________
6. Salary to be received by each partner--__________________
7. Sharing of profits and losses--________________________
8. Responsibilities of each party--_______________________
   ____
9. Restraints of partners--____________________________
   ____

TYPES OF FARM BUSINESSES
UNIT III

TEST

NAME ________________________________ SCORE ____________________

1. Match the basic forms of business ownership on the right to the correct definitions.

______a. Business owned by two or more persons

______b. Business owned and managed by one person

______c. Organization which is authorized by law to act as a single person although it is made up of one or more persons

1. Sole proprietorship
2. Corporation
3. Partnership

2. Distinguish between advantages (A) and disadvantages (D) of sole proprietorship by placing the correct letter in the blanks provided.

______a. Difficulty of raising capital

______b. Low taxes

______c. Unlimited liability

______d. Personal pride of ownership

______e. Easy to organize and terminate

______f. Few government regulations

______g. Lack of assistance in business operations

______h. Freedom of action

______i. No sharing of profits

3. Distinguish between advantages (A) and disadvantages (D) of a partnership by placing the correct letter in the blanks provided.

______a. Operating economics

______b. Sharing of profits

______c. Increased sources of capital

______d. Unlimited liability

______e. Risk of liquidation

______f. Possibility of disagreement

______g. Division of responsibilities

4. Distinguish between advantages (A) and disadvantages (D) of a corporation by placing the correct letter in the blanks provided.

______a. Only designated officers can make contracts

______b. Sharing of profits

______c. Ownership easily transferred

______d. Limited liability

______e. No freedom of action

______f. Complicated and costly to organize

______g. Variety of skills, abilities, and ideas

5. Select from the following list guidelines for selecting a business partner(s).

______a. Make sure spouses of all parties are able to work together

______b. Make sure your personalities are compatible

______c. Select partner who is strong in those areas in which you are weak

______d. Select partner willing to devote time to more than one business interest

______e. Make sure partner knows who is going to run business

6. Select from the list below the information which should be covered in a contract of co-partnership.

______a. Investment of each partner

______b. Wages of employees

______c. Provision for liquidation

______d. Duration of agreement

______e. Business hours of enterprise

______f. Partners' wages

______g. Prices to be charged

______h. Rent to be paid

______i. Sharing of profits and losses

7. Distinguish between correct (C) and incorrect (I) statements concerning how a corporation is organized and operated. Place the correct letter in the blanks provided.

_____a. Ownership is divided into parts of capital stock called *shares*

_____b. Officers in small corporation generally consist of president, vice-president, and public relations officer

_____c. Stockholders manage the business directly

_____d. Officers may not employ additional persons to operate the business without the expressed consent of the board of directors

_____e. Stockholders own the business

8. Form a partnership with another student.

(NOTE: If this activity has not been accomplished prior to the test, ask the instructor when it should be completed.)

TYPES OF FARM BUSINESSES
UNIT III

ANSWERS TO TEST

1. a. 3
   b. 1
   c. 2
2. a. D
   b. A
   c. D
   d. A
   e. A
   f. A
   g. D
   h. A
   i. A
3. a. A
   b. D
   c. A
   d. D
   e. D
   f. D
   g. A
4. a. A
   b. D
   c. A
   d. A
   e. D
   f. D
   g. A
5. b, c
6. a, d, f, i
7. a. C
   b. I
   c. I
   d. I
   e. C
8. Evaluated to satisfaction of instructor

BASIC TAX STRUCTURE
UNIT IV

UNIT OBJECTIVE

After completion of this unit, the student should be able to list reasons good records are important and list or distinguish between the advantages and disadvantages of the different methods of reporting farm income. The student should be able to distinguish between taxable and nontaxable items and complete Schedule F of a Form 1040. This knowledge will be evidenced by completion of assignment sheets and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with tax management to the correct definitions.
2. List reasons good records are important for income tax management.
3. Match methods of reporting farm income to the correct descriptions.
4. List the advantages and disadvantages of the cash method of reporting farm income.
5. Distinguish between advantages and disadvantages of the accrual method of reporting farm income.
6. Select from a list the advantages of the crop method of reporting farm income.
7. Distinguish between taxable and nontaxable items when given a list.
8. Select from a list ways to avoid extremely high or extremely low taxable incomes.
9. Match methods of depreciation to the correct descriptions.
10. Calculate annual depreciation using the straight line method.
11. Select from a list those persons who must file income tax returns.
12. Complete a Schedule F and transfer information to a Form 1040 when given a situation.

BASIC TAX STRUCTURE
UNIT IV

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

   A. Provide student with objective sheet.

   B. Provide student with information and assignment sheets.

   C. Discuss unit and specific objectives.

   D. Discuss information and assignment sheets.

   E. Contact IRS office for *Teaching Taxes Program*, Form 1040: Individual Income Tax Return, and Schedule F: Farm Income and Expenses.

   F. Have student complete a Form 1040 and Schedule F with the information provided.

   G. Have student complete a Form 1040 and Schedule F using own personal records.

   H. Have student complete and file a Form 1040 if applicable.

   I. Work all problems and check answers on assignment sheets.

   J. Work additional depreciation problems for blackboard assignments.

   K. Give test.

   L. Reteach if necessary.

II. Instructional materials:

   A. Objective sheet

   B. Information sheet

   C. Assignment sheets

      1. Assignment Sheet #1--Calculate Annual Depreciation Using Straight Line Method

      2. Assignment Sheet #2--Complete a Schedule F and Transfer Information to a Form 1040

   D. Answers to assignment sheets

   E. Test

   F. Answers to test

III. Unit references:

A. *Doane's Farm Management Guide.* St. Louis, Missouri: Doane Agriculture Service, Inc., 1971.

B. *Farm Income Tax Management.* Stillwater, Oklahoma: Agricultural Extension Service, Oklahoma State University.

C. Internal Revenue Service. *Your Federal Income Tax.* Publication 17. Washington, D.C.: U.S. Treasury Department, 1977.

IV. Additional materials:

A. Internal Revenue Service. *Teaching Taxes Program*, Publication 19. Teacher's Guide. Washington, D.C.: U.S. Treasury Department, 1977.

B. Internal Revenue Service. *Farm Edition,* Publication 22. Washington, D.C.: U.S. Treasury Department, 1977.

C. Internal Revenue Service. *Farmer's Tax Guide,* Publication 225. Washington, D.C.: U.S. Treasury Department, 1977.

(NOTE: Publications 22, 19, and 225 may be ordered free of charge from the Internal Revenue Service. Internal revenue district offices also have several tax films which can be borrowed on request.)

BASIC TAX STRUCTURE
UNIT IV

INFORMATION SHEET

I. Terms and definitions

A. Form 1040--Individual income tax return

B. Schedule F--Tax form used to report farm income and expenses

(NOTE: Schedule F must be used with the 1040 form to complete farm income and expense records.)

C. Market livestock--Animals raised on farm primarily for sale

D. Purchased livestock--Animals bought for resale

E. Other farm income--Farm income received from sources other than sale of crops and livestock

(NOTE: This includes machine hire, government payments, and patronage dividends.)

F. Depreciation--Decline in value of an asset due to such causes as wear and tear, action of elements, obsolescence, and inadequacy

(NOTE: Assets are items or resources owned by the individual, such as livestock, crops, machinery, and trucks.)

G. Self-employed--Person operating her/his own business

(NOTE: The operation can be on your own farm through your own personal labor or with hired labor, as a tenant, or as a member of a partnership.)

H. Ad valorem tax--Assessment taxes against real property, personal property, and public service property

(NOTE: The greater part of ad valorem taxes goes for the support of public schools and is used for the support of county and sometimes city governments.)

II. Reasons good records are important for income tax management

A. Records identifying receipts make it possible to substantiate the fact that some of these receipts are from a source which makes them nontaxable

INFORMATION SHEET

B. Expenses not recorded at the time they are incurred or paid may be overlooked or forgotten when you prepare the tax return

(NOTE: An overlooked item of $25 could cost you $5 or more in extra tax dollars.)

C. The cost of farm assets should be recorded so the depreciation allowance can be determined

D. Upon audit of an income tax return by the Internal Revenue Service, good records are needed to verify the items reported

E. Records should establish the amount of earnings to be reported for self-employment social security tax purposes

(NOTE: Cancelled checks and deposit slips are the best verifications of transactions.)

III. Methods of reporting farm income

A. Cash method

1. Income is reported in the year cash or its equivalent is received from the sale of produce or property or for services performed

2. Deductions for farm expense items are made in the year in which they are paid out

B. Accrual method

1. Inventories of livestock, crops, produce, feed, supplies, etc., are used to determine gross income

2. Sales are treated as income when the price of the item is recoverable

3. Expenses are deductible when payable

C. Crop method

(NOTE: If producing a crop that takes more than a year from planting to harvesting and selling, use the crop method of accounting. Pine trees are an example of a crop suited for the crop accounting method because the growing period is more than one year.)

1. Expenses of producing the crop are deducted in the year of sale

2. Profit or loss is not determined until the crop is harvested and sold

INFORMATION SHEET

IV. Advantages and disadvantages of the cash method

A. Advantages

1. It is simplest method
2. Individual can choose when to incur income and deduct expenses
3. Individual works with actual money rather than abstract figures

B. Disadvantages--Income may be erratic

1. An unusually good year could balloon income into a higher tax bracket
2. In a low income year, allowable deductions and exemptions may be lost by having too little income

V. Advantages and disadvantages of the accrual method

A. Advantages

1. Levels out income without the necessity of year-end manipulation
2. Defers cost of producing crops, livestock, or other products to be offset against the sale price
3. Enables individual to keep a close check on all operations due to the requirement of more accurate record keeping

B. Disadvantages

1. Requires records to be detailed and complex
2. Involves working with abstract figures rather than actual money
3. Makes actual cash position difficult to determine

VI. Advantages and disadvantages of crop method

A. Advantages

1. Expenses of producing the crop are deducted in the year of sale
2. When the crop is sold, that account is closed and gain or loss is shown in a particular tax year

INFORMATION SHEET

B. Disadvantages

1. Each crop is considered a distinct venture with a separate account

2. The crop method is not applicable to most crops grown in Oklahoma

VII. Taxable and nontaxable items

A. Taxable items

1. Compensation for services

2. Dividends received from business dealings

3 Income from royalties

4. Income from estates and trusts

5. Commissions

6. Gross income from the farm or ranch business

7. Government program payments

(NOTE: Income from interest, rent income, income from partnerships, profits from sales or exchanges of property, gasoline tax refunds, and insurance proceeds received for crop damage or farm building damage are also taxable.)

B. Nontaxable items

1. Exchanges of business property

2. Commodity credit loans on commodities not sold or turned to the government

3. Social security benefits, railroad retirement pensions, and war veteran's disability pensions

4. Fair market value of produce or livestock raised and consumed by farmer and farmer's family

5. Life insurance paid by reason of death

6. Gifts, bequests, and inheritances

7. Loans

8. Income tax refunds

(NOTE: Interest paid in the refund is taxable.)

INFORMATION SHEET

9. Value of work performed by farmer, spouse, or children on the farm

10. Increase in the value of crops, livestock, or other assets unless sold or exchanged when on the cash method of accounting

    (NOTE: Accrual taxpayers must reflect the increases in value.)

11. Sickness and injury benefits if received as damages in settlement of a claim or under a health and accident insurance policy

12. Educational grants and scholarships

VIII. Ways to avoid extremely high or extremely low taxable incomes

A. Periods when income is high

1. Pay debts

2. Hire additional labor

   (NOTE: In 1977, a dependent child using the new low-income allowance may earn $2,950.00 free of tax.)

3. Purchase needed machinery and livestock

4. Hold crops and livestock off market

5. Use maximum initial depreciation

6. Make needed repairs

7. Use income averaging

8. Do extra conservation work

B. Periods when income is low

1. Use slower depreciation

   (NOTE: Method of depreciation on same item must remain consistent from one year to another.)

2. Postpone debt payments

3. Sell crops and livestock

4. Collect accounts receivable

5. Do additional custom work

INFORMATION SHEET

IX. Methods of depreciation

A. Straight line--Yearly depreciation consists of dividing total anticipated depreciation by the number of years the asset is expected to last (Assignment Sheet #1)

B. Diminishing balance--Fixed rate of depreciation is used every year and applies to the value of the asset at the beginning of the year

(NOTE: The rate of depreciation should be nearly twice that used for the straight line method.)

C. Sum of the digits--Annual depreciation is determined by multiplying a fraction times the amount to be depreciated

(NOTE: The amount to be depreciated is determined by the cost minus the salvage value. Salvage value is the value of an asset at the end of its useful life.)

X. Calculating annual depreciation using straight line method (Assignment Sheet #1)

Formula: $$\text{annual depreciation} = \frac{\text{original cost} - \text{salvage value}}{\text{expected life}}$$

Example: Original cost--$300.00

Expected life--10 years

Salvage value--$20.00

Annual depreciation--$300.00 minus $20.00 = $280.00 divided by 10 years equals $28.00 per year

XI. Persons required to file a return

A. Single individual under 65 years of age having $2,950 or more gross income for the year

B. Single individual over age 65 having $3,700 or more gross income for the year

C. Individual with gross income of $750 or more who may be claimed as the dependent of another taxpayer

(NOTE: An unmarried full-time student may earn $2,200 per year and still be claimed as a dependent.)

INFORMATION SHEET

D. Married persons under 65 years of age having the combined gross income of $4,700 per year provided a joint return is filed

E. Married persons, one being above 65 years of age, having a combined gross income of $5,450 per year provided a joint return is filed

F. Married persons, both 65 years of age or older, having a combined gross income of $6,200 per year provided a joint return is filed

G. Self-employed person having net earnings from self-employment of $400 or more per year

(NOTE: This applies to any self-employed person regardless of age.)

H. If income tax was withheld during the year but not enough income earned to file a return, one can get a refund by filing and still be claimed as a dependent by another taxpayer

I. Surviving spouse of a decedent who would have been required to file had the decedent lived and no executor, administrator, or legal representative has been appointed

BASIC TAX STRUCTURE
UNIT IV

ASSIGNMENT SHEET #1--CALCULATE ANNUAL DEPRECIATION USING STRAIGHT LINE METHOD

Calculate the depreciation of the following equipment using the straight line method.

1. Tractor

    Original cost--$36,000

    3 years old

    Expected life--10 years

    Salvage value--$700

    Annual depreciation = ____________________

2. Portable grinder-mixer

    Original cost--$3,500

    1 year old

    Expected life--7 years

    Salvage value--$500

    Annual depreciation = ____________________

3. 16-foot stock trailer

    Original cost--$1,800

    4 years old

    Expected life--5 years

    Salvage value--$200

    Annual depreciation = ____________________

BASIC TAX STRUCTURE
UNIT IV

ASSIGNMENT SHEET #2--COMPLETE A SCHEDULE F AND TRANSFER INFORMATION TO A FORM 1040

Use the following information to complete Schedule F parts I, II, and III and transfer this information to a 1040 form.

1. John Cook is a student who lives with his parents in Stillwater, Oklahoma.
2. John's social security number is 229-46-2479.
3. John worked at the local elevator and earned $2,000 of which $155 was withheld for federal income taxes.
4. According to John's record book, he has the following items set up on a straight line depreciation schedule.
    a. Hog house
        1) 1 year old
        2) Original cost--$85.00
        3) Useful life--10 years
        4) Salvage value--$0
    b. Fence
        1) 1 year old
        2) Original cost--$55.00
        3) Useful life--5 years
        4) Salvage value--$0
    c. Hog house
        1) New (purchased material January 29)
        2) Cost--$95.00
        3) Useful life--10 years
        4) Salvage value--$0

ASSIGNMENT SHEET #2

d. Farm equipment

   1) 1 year old

   2) Original cost--$105.00

   3) Useful life--5 years

   4) Salvage value--$15.00

5. John has two sows which he farrows twice per year and feeds all his pigs out to market weight.

6. John's record book shows the following sales and expenses for the year.

EXPENSES

Date	Item of Expense and Description	Total Expense		Charge to Enterprise						
				1 SWINE		2	3	4	5	6
1-22	2500$^{\#}$ SUPPLEMENT @ 7^{00} cwt.	175	00	175	00					
1-22	10,000 MILO @ 2^{40}/cwt.	240	00	240	00					
4-15	MEDICINE FOR PIGS	9	00	9	00					
3-1	BREEDING FEE	30	00	30	00					
1-29	MATERIALS FOR HOG HOUSE	95	00	95	00					
7-1	13,000 MILO @ 2^{25}	292	50	292	50					
7-1	3,000$^{\#}$ SUPPLEMENT @ 7^{00} cwt.	210	00	210	00					
9-1	BREEDING FEE	30	00	30	00					
10-10	MEDICINE	10	00	10	00					
12-31	COST OF GRAIN STORAGE									
	23,000 @ .05/cwt.	11	50	11	50					

SALES AND OTHER INCOME

Date	Item of Sale and Description	Total Credit		Charge to Enterprise						
				1 SWINE		2	3	4	5	6
6-23	15 PIGS - 3300$^{\#}$ @ $\$$25/cwt.	825	00	825	00					
12-21	17 PIGS - 4080$^{\#}$ @ $\$$24^{50}/cwt.	999	60	999	60					

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ASSIGNMENT SHEET #2

SCHEDULE F (Form 1040)
Department of the Treasury
Internal Revenue Service

Farm Income and Expenses

(Compute social security self-employment tax on Schedule SE)
▶ Attach to Form 1040 or Form 1065. ▶ See Instructions for Schedule F (Form 1040).
▶ If rental income, see instructions before using this schedule.

1977

Name of proprietor(s)

Social security number

Business name and address ▶

Location of farm(s) and number of acres in each farm ▶

Employer identification number (See instructions)

Part I **Farm Income—Cash Receipts and Disbursements Method**

Do not include sales of livestock held for draft, breeding, sport, or dairy purposes; report such sales on Form 4797.

Sales of Purchased Livestock and Other Items Purchased for Resale

a. Description	b. Amount received	c. Cost or other basis
1 Livestock:	$	$
2 Other items:		
3 Totals	$	$
4 Profit or (loss), subtract line 3, column c from line 3, column b ▶		$

Sales of Market Livestock and Produce Raised and Held Primarily for Sale and Other Farm Income

Kind	Quantity	Amount
5 Cattle		$
6 Calves		
7 Sheep		
8 Swine		
9 Poultry		
10 Dairy products		
11 Eggs		
12 Wool		
13 Cotton		
14 Tobacco		
15 Vegetables		
16 Grain		
17 Fruits and nuts		
18 Other (specify):		

OTHER FARM INCOME

19 Machine work	
20 (a) Patronage dividends (See Sch. F instructions)	
(b) Per-unit retains (See Sch. F instructions)	
21 Nonpatronage distributions from exempt cooperatives	
22 Agricultural program payments:	
(a) Cash	
(b) Materials and services	
23 Commodity credit loans under election (or forfeited)	
24 Federal gasoline tax credit	
25 State gasoline tax refund	
26 Other (specify):	
27 Add lines 5 through 26	$
28 Gross profits* (add lines 4 and 27) ▶	$

Part II **Farm Deductions—For Cash and Accrual Method Taxpayers** **F**

Do not include personal or living expenses not attributable to production of farm income, such as taxes, insurance, repairs, etc., on your dwelling.

Items	Amount
29 Labor hired	$
30 Repairs, maintenance	
31 Interest	
32 Rent of farm, pasture	
33 Feed purchased	
34 Seeds, plants purchased	
35 Fertilizers, lime, chemicals	
36 Machine hire	
37 Supplies purchased	
38 Breeding fees	
39 Veterinary fees, medicine	
40 Gasoline, fuel, oil	
41 Storage, warehousing	
42 Taxes	
43 Insurance	
44 Utilities	
45 Freight, trucking	
46 Conservation expenses	
47 Land clearing expenses	
48 Pension and profit-sharing plans (see Sch. F instructions)	
49 Employee benefit programs other than line 48 (see Sch. F instructions)	
50 Other (specify):	
51 Add lines 29 through 50 ▶	$
52 Depreciation (from line 57, Part III) ▶	
53 Total deductions. Add lines 51 and 52 ▶	$

54 Net farm profit or (loss) (subtract line 53 from line 28). Enter here and on Form 1040, line 19 or on Form 1065, line 9. ALSO enter on Schedule SE, Part I, line 1a ▶	$

* Use amount on line 28 for optional method of computing net earnings from self-employment. (See Schedule SE, Part I, line 3.)

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ASSIGNMENT SHEET #2

Part III Depreciation

(Do not include property you and your family occupy as a dwelling, its furnishings, and other items used for personal purposes.)
If you need more space, use Form 4562.

a. Description of property	b. Date acquired	c. Cost or other basis	d. Depreciation allowed or allowable in prior years	e. Method of computing depreciation	f. Life or rate	g. Depreciation for this year
55 Total additional first-year depreciation (do not include in items below) ▶						
56 Other depreciation:						
57 Totals			Enter here and in Part II, line 52 ▶			

Part IV Farm Income—Accrual Method

(Do not include sales of livestock held for draft, breeding, sport, or dairy purposes; report such sales on Form 4797 and omit them from "On hand at beginning of year" column)

Description (Kind of livestock, crops, or other products)	On hand at beginning of year		Purchased during year		Raised during year	Consumed or lost during year	Sold during year		On hand at end of year	
	Quantity	Inventory value	Quantity	Amount paid	Quantity	Quantity	Quantity	Amount received	Quantity	Inventory value
		$		$				$		$
58 [illegible]als (enter here and in Part V below)		$ (Enter on line 68)		$ (Enter on line 69)				$ (Enter on line 60)		$ (Enter on line 59)

Part V Summary of Income and Deductions—[illegible]ccrual Method

59 Inventory of livestock, crops, and products at end of year		$
60 Sales of livestock, crops, and products during year	$	
61 Agricultural program payments: (a) Cash		
(b) Materials and services		
62 Commodity credit loans under election (or forfeited)		
63 Federal gasoline tax credit		
64 State gasoline tax refund		
65 Other farm income (specify):		
66 Add lines 60 through 65		
67 Total (add lines 59 and 66)		$
68 Inventory of livestock, crops, and products at beginning of year	$	
69 Cost of livestock and produ[illegible]s purchased during year		
70 Gross profits* (subtract the sum of lines 68 and 69 from line 67) . . . . ▶		$
71 Total deductions from Part I[illegible], line 53		$
72 Net farm profit or (loss) (subtract line 71 from line 70). Enter here and on Form 1040, line 19 or on Form 1065, line 9. **ALSO** enter on Schedule SE, Part I, line 1a . . . . ▶		$

* Use amount on line 70 for option[illegible] method of computing net earnings from self-employment. (See Schedule SE, Part I, line 3.)

ASSIGNMENT SHEET #2

Form **1040** Department of the Treasury—Internal Revenue Service
U.S. Individual Income Tax Return **1977**

For the year January 1–December 31, 1977, or other taxable year beginning , 1977 ending , 19

Use IRS label. Otherwise, print or type.

First name and initial (if joint return, give first names and initials of both)	Last name	Your social security number
Present home address (Number and street, including apartment number, or rural route)	For Privacy Act Notice, see page 3 of Instructions.	Spouse's social security no.
City, town or post office, State and ZIP code	Occupation	Yours ▶ Spouse's ▶

Presidential Election Campaign Fund ▶ Do you want $1 to go to this fund? . . . . ☐ Yes ☐ No
If joint return, does your spouse want $1 to go to this fund? . ☐ Yes ☐ No
Note: *Checking "Yes" will not increase your tax or reduce your refund.*

Filing Status

Check Only One Box

1 ☐ Single
2 ☐ Married filing joint return (even if only one had income)
3 ☐ Married filing separately. If spouse is also filing, give spouse's social security number in the space above and enter full name here ▶
4 ☐ Unmarried Head of Household. Enter qualifying name ▶ See page 7 of Instructions.
5 ☐ Qualifying widow(er) with dependent child (Year spouse died ▶ 19). See page 7 of Instructions.

Exemptions

Always check the "Yourself" box. Check other boxes if they apply.

6a ☐ Yourself ☐ 65 or over ☐ Blind
b ☐ Spouse ☐ 65 or over ☐ Blind
Enter number of boxes checked on 6a and b ▶ ☐

c First names of your dependent children who lived with you ▶
Enter number of children listed ▶ ☐

d Other dependents: (1) Name	(2) Relationship	(3) Number of months lived in your home.	(4) Did dependent have income of $750 or more?	(5) Did you provide more than one-half of dependent's support?

Enter number of other dependents ▶ ☐

7 Total number of exemptions claimed . . . . Add numbers entered in boxes above ▶ ☐

Please Attach Copy B of Forms W-2 Here

Income

8	Wages, salaries, tips, and other employee compensation. (Attach Forms W-2. If unavailable, see page 5 of Instructions.)	8	
9	Interest income. (If over $400, attach Schedule B.)	9	
10a	Dividends (If over $400, attach Schedule B) ...., 10b less exclusion ...., **Balance** ▶ (See pages 9 and 17 of Instructions)	10c	
	(If you have no other income, skip lines 11 through 20 and go to line 21.)		
11	State and local income tax refunds (does not apply if refund is for year you took standard deduction)	11	
12	Alimony received	12	
13	Business income or (loss) (attach Schedule C)	13	
14	Capital gain or (loss) (attach Schedule D)	14	
15	50% of capital gain distributions not reported on Schedule D	15	
16	Net gain or (loss) from Supplemental Schedule of Gains and Losses (attach Form 4797)	16	
17	Fully taxable pensions and annuities not reported on Schedule E	17	
18	Pensions, annuities, rents, royalties, partnerships, estates or trusts, etc. (attach Schedule E)	18	
19	Farm income or (loss) (attach Schedule F)	19	
20	Other (state nature and source—see page 9 of Instructions) ▶	20	
21	Total income. Add lines 8, 9, and 10c through 20 ▶	21	

Please Attach Check or Money Order Here

Adjustments to Income *(If none, skip lines 22 through 27 and enter zero on line 28.)*

22	Moving expense (attach Form 3903)	22	
23	Employee business expenses (attach Form 2106)	23	
24	Payments to an individual retirement arrangement (from attached Form 5329, Part III)	24	
25	Payments to a Keogh (H.R. 10) retirement plan	25	
26	Forfeited interest penalty for premature withdrawal	26	
27	Alimony paid (see page 11 of Instructions)	27	

28	Total adjustments. Add lines 22 through 27 ▶	28	
29	Subtract line 28 from line 21	29	
30	Disability income exclusion (sick pay) (attach Form 2440)	30	
31	Adjusted gross income. Subtract line 30 from line 29. Enter here and on line 32. If you want IRS to figure your tax for you, see page 4 of the Instructions ▶	31	

ASSIGNMENT SHEET #2

Form 1040 (1977) Page 2

Tax Computation

32 Amount from line 31 32

33 If you itemize deductions, enter excess itemized deductions from Schedule A, line 41 . . . .

If you do NOT itemize deductions, enter zero 33

Caution: *If you have unearned income and can be claimed as a dependent on your parent's return, check here ▶ ☐ and see page 11 of the Instructions. Also see page 11 of the Instructions if:*

- You are married filing a separate return and your spouse itemizes deductions, OR
- You file Form 4563, OR
- You are a dual-status alien.

34 Tax Table Income. Subtract line 33 from line 32 34

Note: See Instructions for line 35 on page 11. Then find your tax on the amount on line 34 in the Tax Tables. Enter the tax on line 35. However, if line 34 is more than $20,000 ($40,000 if you checked box 2 or 5) or you have more exemptions than those covered in the Tax Tables for your filing status, use Part I of Schedule TC (Form 1040) to figure your tax. You must also use Schedule TC if you file Schedule G (Form 1040), Income Averaging.

35 Tax. Check if from ☐ Tax Tables or ☐ Schedule TC 35

36 Additional taxes. (See page 12 of Instructions.) Check if from ☐ Form 4970, ☐ Form 4972, ☐ Form 5544, ☐ Form 5405, or ☐ Section 72(m)(5) penalty tax 36

37 **Total.** Add lines 35 and 36 . . . . . ▶ 37

Credits

38 Credit for contributions to candidates for public office 38

39 Credit for the elderly (attach Schedules R&RP) 39

40 Credit for child and dependent care expenses (attach Form 2441) . 40

41 Investment credit (attach Form 3468) 41

42 Foreign tax credit (attach Form 1116) 42

43 Work Incentive (WIN) Credit (attach Form 4874) 43

44 New jobs credit (attach Form 5884) 44

45 See page 12 of Instructions 45

46 **Total credits.** Add lines 38 through 45 46

47 **Balance.** Subtract line 46 from line 37 and enter difference (but not less than zero) . . . . ▶ 47

Other Taxes

48 Self-employment tax (attach Schedule SE) 48

49 Minimum tax. Check here ▶ ☐ and attach Form 4625 49

50 Tax from recomputing prior-year investment credit (attach Form 4255) 50

51 Social security tax on tip income not reported to employer (attach Form 4137) 51

52 Uncollected employee social security tax on tips (from Form W-2) 52

53 Tax on an individual retirement arrangement (attach Form 5329) 53

54 **Total tax.** Add lines 47 through 53 . . . . . ▶ 54

Payments

55 Total Federal income tax withheld (attach Forms W-2, W-2G, and W-2P to front) 55

56 1977 estimated tax payments (include amount allowed as credit from 1976 return) 56

57 Earned income credit. If line 31 is under $8,000, see page 2 of Instructions. If eligible, enter child's name ▶ 57

58 Amount paid with Form 4868 58

59 Excess FICA and RRTA tax withheld (two or more employers) . . . 59

60 Credit for Federal tax on special fuels, etc. (attach Form 4136) . . 60

61 Credit from a Regulated Investment Company (attach Form 2439) 61

61a See page 13 of Instructions 61a

62 **Total.** Add lines 55 through 61a . . . . . ▶ 62

Refund or Due

63 If line 62 is larger than line 54, enter amount **OVERPAID** . . . . . ▶ 63

64 Amount of line 63 to be **REFUNDED TO YOU** . . . . . ▶ 64

65 Amount of line 63 to be credited on 1978 estimated tax . . . . ▶ 65

66 If line 54 is larger than line 62, enter **BALANCE DUE.** Attach check or money order for full amount payable to "Internal Revenue Service." Write social security number on check or money order . . . ▶ 66
(Check ▶ ☐ if Form 2210 (2210F) is attached. See page 14 of Instructions.)

Please Sign Here

Under penalties of perjury, I declare that I have examined this return, including accompanying schedules and statements, and to the best of my knowledge and belief, it is true, correct, and complete. Declaration of preparer (other than taxpayer) is based on all information of which preparer has any knowledge.

▶ Your signature Date

▶ Spouse's signature (if filing jointly, BOTH must sign even if only one had income)

▶ Paid preparer's signature and identifying number (see instructions)

▶ Paid preparer's address (or employer's name, address, and identifying number)

BASIC TAX STRUCTURE
UNIT IV

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1

1. $3,530.00
2. $428.57
3. $320.00

Assignment Sheet #2

(NOTE: Completed tax forms are shown on the following pages.)

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SCHEDULE F
(Form 1040)
Department of the Treasury
Internal Revenue Service

Farm Income and Expenses

(Compute social security self-employment tax on Schedule SE)
▶ Attach to Form 1040 or Form 1065. ▶ See Instructions for Schedule F (Form 1040).
▶ If rental income, see instructions before using this schedule.

1977

Name of proprietor(s) John Cook
Social security number 229 46 2479
Business name and address ▶
Location of farm(s) and number of acres in each farm ▶
Employer identification number (See instructions)

Part I Farm Income—Cash Receipts and Disbursements Method

Do not include sales of livestock held for draft, breeding, sport, or dairy purposes; report such sales on Form 4797.

Sales of Purchased Livestock and Other Items Purchased for Resale

a. Description	b. Amount received		c. Cost or other basis	
1 Livestock:	$		$	
2 Other items:				
3 Totals	$		$	
4 Profit or (loss), subtract line 3, column c from line 3, column b ▶			$	

Sales of Market Livestock and Produce Raised and Held Primarily for Sale and Other Farm Income

Kind	Quantity	Amount	
5 Cattle		$	
6 Calves			
7 Sheep			
8 Swine	32	1824	60
9 Poultry			
10 Dairy products			
11 Eggs			
12 Wool			
13 Cotton			
14 Tobacco			
15 Vegetables			
16 Grain			
17 Fruits and nuts			
18 Other (specify):			

OTHER FARM INCOME		
19 Machine work		
20 (a) Patronage dividends (See Sch. F instructions)		
(b) Per-unit retains (See Sch. F instructions)		
21 Nonpatronage distributions from exempt cooperatives		
22 Agricultural program payments:		
(a) Cash		
(b) Materials and services		
23 Commodity credit loans under election (or forfeited)		
24 Federal gasoline tax credit		
25 State gasoline tax refund		
26 Other (specify):		
27 Add lines 5 through 26	$ 1824	60
28 Gross profits* (add lines 4 and 27) ▶	$ 1824	60

Part II Farm Deductions—For Cash and Accrual Method Taxpayers

F

Do not include personal or living expenses not attributable to production of farm income, such as taxes, insurance, repairs, etc., on your dwelling.

Items	Amount	
29 Labor hired	$	
30 Repairs, maintenance		
31 Interest		
32 Rent of farm, pasture		
33 Feed purchased	917	50
34 Seeds, plants purchased		
35 Fertilizers, lime, chemicals		
36 Machine hire		
37 Supplies purchased		
38 Breeding fees	60	00
39 Veterinary fees, medicine	19	00
40 Gasoline, fuel, oil		
41 Storage, warehousing	11	50
42 Taxes		
43 Insurance		
44 Utilities		
45 Freight, trucking		
46 Conservation expenses		
47 Land clearing expenses		
48 Pension and profit-sharing plans (see Sch. F instructions)		
49 Employee benefit programs other than line 48 (see Sch. F instructions)		
50 Other (specify):		
51 Add lines 29 through 50 ▶	$ 1008	00
52 Depreciation (from line 57, Part III) ▶	47	00
53 Total deductions. Add lines 51 and 52 ▶	$ 1055	00

54 Net farm profit or (loss) (subtract line 53 from line 28). Enter here and on Form 1040, line 19 or on Form 1065, line 9. **ALSO** enter on Schedule SE, Part I, line 1a ▶	$ 769	60

* Use amount on line 28 for optional method of computing net earnings from self-employment. (See Schedule SE, Part I, line 3.)

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Part III Depreciation

(Do not include property you and your family occupy as a dwelling, its furnishings, and other items used for personal purposes.)
If you need more space, use Form 4562.

a. Description of property	b. Date acquired	c. Cost or other basis	d. Depreciation allowed or allowable in prior years	e. Method of computing depreciation	f. Life or rate	g. Depreciation for this year	
55 Total additional first-year depreciation (do not include in items below) →							
56 Other depreciation:							
Hog house	-1976	85.00	8.50	St. Line	10	8	50
Hog house	1977	95.00	0	St. Line	10	9	50
Machinery & Equipment	1976	105-15=90	18.00	St. Line	5	18	00
Fence	1976	55.00	11.00	St. Line	5	11	00
57 Totals			Enter here and in Part II, line 52 ▶			47	00

Part IV Farm Income—Accrual Method

(Do not include sales of livestock held for draft, breeding, sport, or dairy purposes; report such sales on Form 4797 and omit them from "On hand at beginning of year" column)

Description (Kind of livestock, crops, or other products)	On hand at beginning of year		Purchased during year		Raised during year	Consumed or lost during year	Sold during year		On hand at end of year	
	Quantity	Inventory value	Quantity	Amount paid	Quantity	Quantity	Quantity	Amount received	Quantity	Inventory value
		$		$				$		$
58 Totals (enter here and in Part V below)		$ (Enter on line 68)		$ (Enter on line 69)				$ (Enter on line 60)		$ (Enter on line 59)

Part V Summary of Income and Deductions—Accrual Method

59 Inventory of livestock, crops, and products at end of year		$
60 Sales of livestock, crops, and products during year	$	
61 Agricultural program payments: (a) Cash		
(b) Materials and services		
62 Commodity credit loans under election (or forfeited)		
63 Federal gasoline tax credit		
64 State gasoline tax refund		
65 Other farm income (specify):		
66 Add lines 60 through 65		
67 Total (add lines 59 and 66)		$
68 Inventory of livestock, crops, and products at beginning of year	$	
69 Cost of livestock and products purchased during year		
70 Gross profits* (subtract the sum of lines 68 and 69 from line 67) ▶		$
71 Total deductions from Part II, line 53		$
72 Net farm profit or (loss) (subtract line 71 from line 70). Enter here and on Form 1040, line 19 or on Form 1065, line 9. ALSO enter on Schedule SE, Part I, line 1a ▶		$

* Use amount on line 70 for optional method of computing net earnings from self-employment. (See Schedule SE, Part I, line 3.)

Ag III - 107-D

Department of the Treasury—Internal Revenue Service

Form 1040 U.S. Individual Income Tax Return 1977

For the year January 1–December 31, 1977, or other taxable year beginning , 1977 ending , 19

Use IRS label. Otherwise, print or type.

First name and initial (if joint return, give first names and initials of both): John	Last name: Cook	Your social security number: 229 46 2479
Present home address (Number and street, including apartment number, or rural route): Box 11	For Privacy Act Notice, see page 3 of Instructions.	Spouse's social security no.
City, town or post office, State and ZIP code: Stillwater, Ok. 74074	Occupation	Yours ▶ student Spouse's ▶

Presidential Election Campaign Fund ▶ Do you want $1 to go to this fund? ☐ Yes ☐ No

If joint return, does your spouse want $1 to go to this fund? ☐ Yes ☐ No

Note: Checking "Yes" will not increase your tax or reduce your refund.

Filing Status

Check Only One Box

1 ☑ Single
2 ☐ Married filing joint return (even if only one had income)
3 ☐ Married filing separately. If spouse is also filing, give spouse's social security number in the space above and enter full name here ▶
4 ☐ Unmarried Head of Household. Enter qualifying name ▶ See page 7 of Instructions.
5 ☐ Qualifying widow(er) with dependent child (Year spouse died ▶ 19). See page 7 of Instructions.

Exemptions

Always check the "Yourself" box. Check other boxes if they apply.

6a ☑ Yourself ☐ 65 or over ☐ Blind
b ☐ Spouse ☐ 65 or over ☐ Blind
Enter number of boxes checked on 6a and b ▶ 1
c First names of your dependent children who lived with you ▶
Enter number of children listed ▶

d Other dependents: (1) Name	(2) Relationship	(3) Number of months lived in your home.	(4) Did dependent have income of $750 or more?	(5) Did you provide more than one-half of dependent's support?

Enter number of other dependents ▶

7 Total number of exemptions claimed .... Add numbers entered in boxes above ▶

Please Attach Copy B of Forms W-2 Here

Income

8	Wages, salaries, tips, and other employee compensation. (Attach Forms W-2. If unavailable, see page 5 of Instructions.)	8	2000 00
9	Interest income. (If over $400, attach Schedule B.)	9	
10a	Dividends (If over $400, attach Schedule B) ...., 10b less exclusion ...., Balance ▶ (See pages 9 and 17 of Instructions)	10c	
	(If you have no other income, skip lines 11 through 20 and go to line 21.)		
11	State and local income tax refunds (does not apply if refund is for year you took standard deduction)	11	
12	Alimony received	12	
13	Business income or (loss) (attach Schedule C)	13	
14	Capital gain or (loss) (attach Schedule D)	14	
15	50% of capital gain distributions not reported on Schedule D	15	
16	Net gain or (loss) from Supplemental Schedule of Gains and Losses (attach Form 4797)	16	
17	Fully taxable pensions and annuities not reported on Schedule E	17	
18	Pensions, annuities, rents, royalties, partnerships, estates or trusts, etc. (attach Schedule E)	18	
19	Farm income or (loss) (attach Schedule F)	19	769 60
20	Other (state nature and source—see page 9 of Instructions) ▶	20	
21	**Total income.** Add lines 8, 9, and 10c through 20 ▶	21	2769 60

Please Attach Check or Money Order Here

Adjustments to Income (If none, skip lines 22 through 27 and enter zero on line 28.)

22	Moving expense (attach Form 3903)	22	
23	Employee business expenses (attach Form 2106)	23	
24	Payments to an individual retirement arrangement (from attached Form 5329, Part III)	24	
25	Payments to a Keogh (H.R. 10) retirement plan	25	
26	Forfeited interest penalty for premature withdrawal	26	
27	Alimony paid (see page 11 of Instructions)	27	
28	**Total adjustments.** Add lines 22 through 27 ▶	28	0
29	Subtract line 28 from line 21	29	2769 60
30	Disability income exclusion (sick pay) (attach Form 2440)	30	
31	**Adjusted gross income.** Subtract line 30 from line 29. Enter here and on line 32. If you want IRS to figure your tax for you, see page 4 of the Instructions ▶	31	2769 60

108-D

Form 1040 (1977)

Tax Computation	32 Amount from line 31				32	2769	60
	33 If you itemize deductions, enter excess itemized deductions from Schedule A, line 41 If you do NOT itemize deductions, enter zero				33	0	
	Caution: *If you have unearned income and can be claimed as a dependent on your parent's return, check here* ▶ ☐ *and see page 11 of the Instructions. Also see page 11 of the Instructions if:* ● You are married filing a separate return and your spouse itemizes deductions, OR ● You file Form 4563, OR ● You are a dual-status alien.						
	34 Tax Table Income. Subtract line 33 from line 32				34	2769	60
	Note: See Instructions for line 35 on page 11. Then find your tax on the amount on line 34 in the Tax Tables. Enter the tax on line 35. However, if line 34 is more than $20,000 ($40,000 if you checked box 2 or 5) or you have more exemptions than those covered in the Tax Tables for your filing status, use Part I of Schedule TC (Form 1040) to figure your tax. You must also use Schedule TC if you file Schedule G (Form 1040), Income Averaging.						
	35 Tax. Check if from ☐ Tax Tables or ☐ Schedule TC				35	0	
	36 Additional taxes. (See page 12 of Instructions.) Check if from ☐ Form 4970, ☐ Form 4972, ☐ Form 5544, ☐ Form 5405, or ☐ Section 72(m)(5) penalty tax				36		
	37 **Total.** Add lines 35 and 36 ▶				37	0	
Credits	38 Credit for contributions to candidates for public office	38					
	39 Credit for the elderly (attach Schedules R&RP)	39					
	40 Credit for child and dependent care expenses (attach Form 2441)	40					
	41 Investment credit (attach Form 3468)	41					
	42 Foreign tax credit (attach Form 1116)	42					
	43 Work Incentive (WIN) Credit (attach Form 4874)	43					
	44 New jobs credit (attach Form 5884)	44					
	45 See page 12 of Instructions	45					
	46 **Total credits.** Add lines 38 through 45				46	0	
	47 **Balance.** Subtract line 46 from line 37 and enter difference (but not less than zero) ▶				47	0	
Other Taxes	48 Self-employment tax (attach Schedule SE)				48		
	49 Minimum tax. Check here ▶ ☐ and attach Form 4625				49		
	50 Tax from recomputing prior-year investment credit (attach Form 4255)				50		
	51 Social security tax on tip income not reported to employer (attach Form 4137)				51		
	52 Uncollected employee social security tax on tips (from Form W-2)				52		
	53 Tax on an individual retirement arrangement (attach Form 5329)				53		
	54 **Total tax.** Add lines 47 through 53 ▶				54	0	
Payments	55 Total Federal income tax withheld (attach Forms W-2, W-2G, and W-2P to front)	55	155	00			
	56 1977 estimated tax payments (include amount allowed as credit from 1976 return)	56					
	57 Earned income credit. If line 31 is under $8,000, see page 2 of Instructions. If eligible, enter child's name ▶	57					
	58 Amount paid with Form 4868	58					
	59 Excess FICA and RRTA tax withheld (two or more employers)	59					
	60 Credit for Federal tax on special fuels, etc. (attach Form 4136)	60					
	61 Credit from a Regulated Investment Company (attach Form 2439)	61					
	61a See page 13 of Instructions	61a					
	62 **Total.** Add lines 55 through 61a ▶				62	155	00
Refund or Due	63 If line 62 is larger than line 54, enter amount **OVERPAID** ▶				63	155	00
	64 Amount of line 63 to be **REFUNDED TO YOU** ▶				64	155	00
	65 Amount of line 63 to be credited on 1978 estimated tax ▶	65					
	66 If line 54 is larger than line 62, enter **BALANCE DUE.** Attach check or money order for full amount payable to "Internal Revenue Service." Write social security number on check or money order ▶ (Check ▶ ☐ if Form 2210 (2210F) is attached. See page 14 of Instructions.)				66		

Please Sign Here

Under penalties of perjury, I declare that I have examined this return, including accompanying schedules and statements, and to the best of my knowledge and belief, it is true, correct, and complete. Declaration of preparer (other than taxpayer) is based on all information of which preparer has any knowledge.

▶ John Cook 3-21-78

Your signature Date

▶ Paid preparer's signature and identifying number (see instructions)

▶ Spouse's signature (if filing jointly, BOTH must sign even if only one had income)

▶ Paid preparer's address (or employer's name, address, and identifying number)

BASIC TAX STRUCTURE
UNIT IV

TEST

NAME ______________________________ SCORE ______________

1. Match the terms on the right to the correct definitions.

______a. Assessment taxes against real property, personal property, and public service property

______b. Decline in value of an asset due to such causes as wear and tear, action of elements, obsolescence, and inadequacy

______c. Individual income tax return

______d. Person operating her/his own business

______e. Tax form used to report farm income and expenses

______f. Animals bought for resale

______g. Farm income received from sources other than sale of crops and livestock

______h. Animals raised on farm primarily for sale

1. Form 1040
2. Schedule F
3. Market livestock
4. Purchased livestock
5. Other farm income
6. Depreciation
7. Self-employed
8. Ad valorem tax

2. List four reasons good records are important for income tax management.

a. ____

____

b. ____

____

c. ____

____

d. ____

____

3. Match the methods of reporting farm income on the right to the correct descriptions.

_____a. Expenses of producing the crop are deducted in the year of sale; profit or loss is not determined until the crop is harvested and sold

_____b. Inventories of livestock, crops, produce, feed, supplies, etc., are used to determine gross income; sales are treated as income when the price of the item is recoverable; expenses are deductible when payable

_____c. Income is reported in the year cash or its equivalent is received from the sale of produce or property or for services performed; deductions for farm expense items are made in the year in which they are paid

1. Cash method
2. Accrual method
3. Crop method

4. List the advantages and disadvantages of the cash method of reporting farm income.

a. Advantages--____

____

____

____

b. Disadvantages--____

____

____

____

5. Distinguish between advantages (A) and disadvantages (D) of the accrual method of reporting farm income by placing the correct letter in the blanks provided.

_____a. Involves working with abstract figures rather than actual money

_____b. Makes actual cash position difficult to determine

_____c. Defers cost of producing crops, livestock, or other products to be offset against the sale price

_____d. Levels out income without the necessity of year-end manipulation ______e. Requires records to be detailed and complex

______f. Enables individual to keep a close check on all operations due to the requirement of more accurate record keeping

6. Select from the list below the advantages of the crop method for reporting farm income.

______a. Each crop is considered a distinct venture with a separate account

______b. Expenses of producing the crop are deducted in the year of sale

______c. When the crop is sold, that account is closed and gain or loss is shown in a particular tax year

______d. The crop method is not applicable to most crops grown in Oklahoma

7. Distinguish between taxable and nontaxable items by placing a "T" in front of the taxable items and an "N" in front of the nontaxable items.

______a. Dividends received from business dealings

______b. Income from royalties

______c. Exchanges of business property

______d. Commissions

______e. Compensation for services

______f. Gross income from the farm or ranch business

______g. Government program payments

______h. Social security benefits, railroad retirement pensions, and war veteran's disability pensions

______i. Life insurance paid by reason of death

8. Select from the list below ways to avoid extremely high or extremely low taxable incomes. Place an "X" by the correct statements.

a. Periods when income is high

______ 1) Pay debts

______ 2) Hire additional labor

______ 3) Use slower depreciation

______ 4) Hold crops and livestock off market

______ 5) Collect accounts receivable

b. Periods when income is low

_____ 1) Postpone debt payments

_____ 2) Sell crops and livestock

_____ 3) Use maximum initial depreciation

_____ 4) Do additional custom work

_____ 5) Make needed repairs

9. Match the methods of depreciation on the right to the correct descriptions.

_____a. Fixed rate of depreciation is used every year and applies to the value of the asset at the beginning of the year

_____b. Yearly depreciation consists of dividing total anticipated depreciation by the number of years the asset is expected to last

_____c. Annual depreciation is determined by multiplying a fraction times the amount to be depreciated

1. Straight line

2. Diminishing balance

3. Sum of the digits

10. Calculate the annual depreciation of a plow using the straight line method.

Original cost--$1,000.00

Expected life--10 years

Projected salvage value--$100.00

Annual depreciation-- ________________

11. Select from the list below those persons who must file income tax returns. Place an "X" by the correct answers.

_____a. Single individual under 65 years of age having $2,950 or more gross income for the year

_____b. Individual with gross income of $600 or more who may be claimed as the dependent of another taxpayer

_____c. Married persons under 65 years of age having the combined gross income of $4,700 per year provided a joint return is filed

_____d. Self-employed person having net earnings from self-employment of $350 per year

12. Complete a Schedule F and transfer information to a Form 1040 when given a situation.

    (NOTE: If this has not been accomplished prior to the test, ask the instructor when the above activity should be completed.)

BASIC TAX STRUCTURE
UNIT IV

ANSWERS TO TEST

1. a. 8

   b. 6

   c. 1

   d. 7

   e. 2

   f. 4

   g. 5

   h. 3

2. Any four of the following:

   a. Records identifying receipts make it possible to substantiate the fact that some of these receipts are from a source which makes them nontaxable

   b. Expenses not recorded at the time they are incurred or paid may be overlooked or forgotten when you prepare the tax return

   c. The cost of farm assets should be recorded so the depreciation allowance can be determined

   d. Upon audit of an income tax return by the Internal Revenue Service, good records are needed to verify the items reported

   e. Records should establish the amount of earnings to be reported for self-employment social security tax purposes

3. a. 3

   b. 2

   c. 1

4. a. Advantages

      1) It is simplest method

      2) Individual can choose when to incur income and deduct expenses

      3) Individual works with actual money rather than abstract figures

b. Disadvantages--Income may be erratic

1) An unusually good year could balloon income into a higher tax bracket

2) In a low income year, allowable deductions and exemptions may be lost by having too little income

5. a. D

   b. D

   c. A

   d. A

   e. D

   f. A

6. b, c

7. a. T

   b. T

   c. N

   d. T

   e. T

   f. T

   g. T

   h. N

   i. N

8. a. 1, 2, 4

   b. 1, 2, 4

9. a. 2

   b. 1

   c. 3

10. $90

11. a, c

12. Evaluated to the satisfaction of the instructor

[redacted] section E
Agricultural Mechanics.

USING THE FARM LEVEL
UNIT I

UNIT OBJECTIVE

After completion of this unit, the student should be able to calculate problems while performing different leveling jobs and record the results in a field notebook. The student should be able to demonstrate the ability to set up and adjust the instrument, read the rod, and perform contour and differential leveling. This knowledge will be evidenced by completion of assignment sheets, job sheets, and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with using the farm level to the correct definitions.
2. Identify the types of levels.
3. Identify the parts of the farm level.
4. Identify the cross hairs in the telescope.
5. Identify the types of self-reading rods.
6. Match the markings on the farm level to the correct graduations.
7. Read the self-reading rods.
8. Identify the parts of the rod.
9. Match the parts of the rod to their correct uses.
10. Select from a list common errors in measurement.
11. Select from a list rules for care of the farm level.
12. Identify hand motions used by the instrument person to guide the target person.
13. Select from a list points to follow in keeping good field notes.
14. Calculate problems and record the results in the field notebook.
15. Demonstrate the ability to:
    a. Set up and adjust the farm level.
    b. Complete a differential leveling problem.
    c. Complete a profile leveling problem.

USING THE FARM LEVEL
UNIT I

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

   A. Provide student with objective sheet.

   B. Provide student with information and assignment sheets.

   C. Make transparencies.

   D. Discuss unit and specific objectives.

   E. Discuss information sheet.

   F. Demonstrate and discuss procedures outlined in the job sheets and assignment sheets.

      (NOTE: Have students complete Job Sheets #2 and #3 before attempting Assignment Sheets #3 and #4.)

   G. Assign student a leveling job, such as differential leveling, profile leveling, or run graded or contour lines.

   H. Secure resource person such as employee of SCS to discuss with class the importance of learning to use farm level.

   I. Give test.

II. Instructional materials:

   A. Objective sheet

   B. Information sheet

   C. Transparency masters

      1. TM 1--Types of Levels

      2. TM 2--Parts of the Level

      3. TM 3--Self-Reading Rods

      4. TM 4--Reading the Rod

      5. TM 5--Parts of the Rod

      6. TM 6--Hand Motions

D. Assignment sheets

1. Assignment Sheet #1--Read the Self-Reading Rods

2. Assignment Sheet #2--Calculate Field Data and Record in Field Notebook Form

3. Assignment Sheet #3--Complete a Differential Leveling Problem

4. Assignment Sheet #4--Complete a Profile Leveling Problem

E. Answers to assignment sheets

F. Job sheets

1. Job Sheet #1--Set Up and Adjust the Farm Level

2. Job Sheet #2--Complete a Differential Leveling Problem

3. Job Sheet #3--Complete a Profile Leveling Problem

G. Test

H. Answers to test

III. Unit references:

A. Schwab, Glenn O.; Frevert, Richard K.; Barnes, Kenneth K.; and Edminster, Talcott W. *Elementary Soil and Water Engineering.* New York: John Wiley and Sons, Inc., 1957.

B. Phipps, Lloyd J.; McColly, H. F.; Scranton, L. L.; and Cook, G. C. *Farm Mechanics Text and Handbook.* Danville, Illinois: The Interstate Printers and Publishers, Inc., 1967.

C. *Setting Up the Instrument.* San Luis Obispo: California State Polytechnic College. (Color filmstrip and manual)

D. *Reading the Rod.* San Luis Obispo: California State Polytechnic College. (Color filmstrip and manual)

E. Roth, L. O.; Crow, Frank; and Mahoney, G. W. A. *An Introduction to Agricultural Engineering.* Westport, Connecticut: The AVI Publishing Company, Inc., 1975.

USING THE FARM LEVEL
UNIT I

INFORMATION SHEET

I. Terms and definitions

A. Bench mark (BM)--Permanent point of known or assumed elevation from which leveling surveys are started

B. Foresight (FS)--Rod reading taken on a point of unknown elevation

C. Backsight (BS)--Rod reading taken on a point of known elevation

D. Height of instrument (HI)--Elevation of the level line of sight or of the cross hairs in the telescope with respect to the bench mark

E. Turning point (TP)--Solid location (usually a temporary stake) on which a foresight is taken, the instrument moved, and then a backsight taken to determine a new HI

F. Field notebook--Book used to keep surveying information

G. Line of sight--Level line through the instrument, as viewed by the eye; place where vertical hair crosses the horizontal hair

H. Self-reading rod--Rod that is read through the instrument by the instrument person

I. Differential leveling--Method of determining the difference in elevation between two points

J. Profile leveling--Method of determining the elevation of a series of points at measured intervals along a line

K. Contour line--Line connecting points on the land surface which have the same elevation

L. Level rod--Rod used in leveling; normally graduated in tenths and hundredths of a foot

M. Topographic leveling--Process by which the elevation of spaced grid points in a field are determined

N. Error of closure--Difference between original BM1 elevation and the calculated BM1 elevation after a return check, if they fail to agree

Example:		
	100.00	Original BM1 elevation
	99.99	Calculated BM1 elevation
	0.01	Error of closure

INFORMATION SHEET

II. Types of levels (Transparency 1)

   A. Engineer's dumpy

   B. Engineer's wild tilting

   C. Turret

      (NOTE: This is the level commonly used by farmers.)

   D. Engineer's Zeiss

   E. Builder's

      (NOTE: The builder's level is the most practical and economical for general use and is sufficiently accurate for most purposes.)

III. Parts of the farm level (Transparency 2)

   A. Eye piece

   B. Focusing screw

   C. Sun shade

   D. Bubble tube

   E. Clamp

   F. Slow motion screw

   G. Leveling head

   H. Head plate

   I. Leveling screw

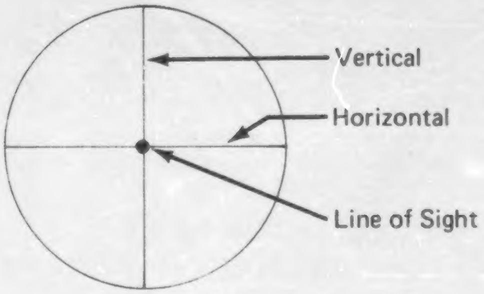
   J. Tripod

   K. Leg thumb nuts

   L. Telescope barrel

INFORMATION SHEET

IV. Cross hairs



A. Vertical

(NOTE: This indicates direction.)

B. Horizontal

(NOTE: This indicates the flat plane.)

C. Line of sight

(NOTE: This is indicated by the cross of the vertical and horizontal hairs.)

V. Self-reading rods (Transparency 3)

A. Positive reading

B. Direct reading

VI. Markings and graduations of the farm level (Transparency 4)

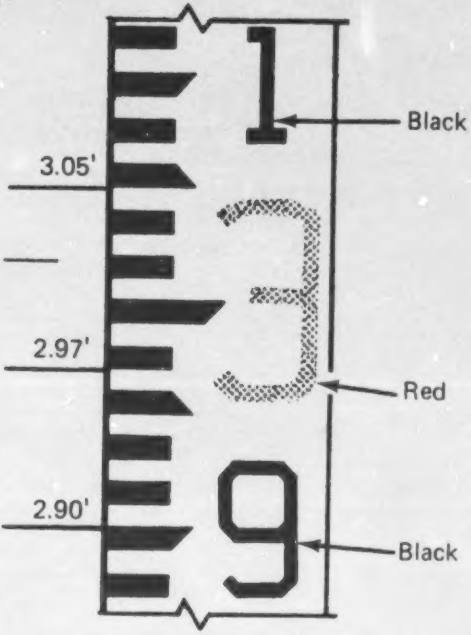
A. Red numbers--Designate feet

B. Black numbers--Indicate tenths of feet

C. Black and white marks--Show hundredths of feet

D. Vernier scale--Reads thousandths of feet

Example:



VII. Reading the self-reading rod (Transparency 4, Assignment Sheet #1)

  A. Positive reading--Read from bottom up

  B. Direct reading--Read from top down

VIII. Parts of the rod (Transparency 5)

  A. Target face

  B. Target clamp

  C. Rod clamp

  D. Vernier scale

IX. Parts of the rod and their uses (Transparency 5)

  A. Target face--Is used for certain types of readings

  B. Target clamp--Holds the target in place

  C. Rod clamp--Holds the rod when extended

  D. Vernier scale--Enables reading to the nearest thousandth of a foot

X. Common errors in measurement

  A. Tape not pulled tight enough

  B. Tape not in proper alignment

INFORMATION SHEET

- C. Plumb bob not used when measuring on slope
- D. Reading or recording the wrong numbers

XI. Care of farm level

- A. Protect against shock and vibration during transport
- B. Keep in box except when in use
- C. Place lens and tripod cap in box after removing from instrument
- D. Attach instrument onto tripod carefully and firmly before moving tripod

  (NOTE: Never force screws or other moving parts of an instrument.)
- E. Use sun shade regardless of the weather
- F. Clean lenses with soft tissue

  (CAUTION: Do not clean with fingers or rough cloth. Do not remove lenses.)
- G. Do not set up instrument in the shade and move to sun without releasing leveling screws

XII. Hand motions (Transparency 6)

- A. Move in this direction
- B. Move up
- C. Move down
- D. Turning point
- E. Observation completed; move on; understood
- F. Come in
- G. Wrong face; check clamp; rod upside down
- H. Use long rod
- i. Wave rod from side to side

INFORMATION SHEET

XIII. Keeping good field notes

A. Reserve first few pages for index

B. Number pages in upper right-hand corner

(NOTE: The double page is considered one page.)

C. Write descriptive title at top of first page for each job

(NOTE: This title should be printed and should show the type of survey, legal description, and name of farm.)

D. Record names of survey party at top of right-hand side

(NOTE: Job assigned to each should be recorded.)

Example: Instrument is designated by ⊼ ; rod person by Ø; recorder by REC; rear chain person by RC; head chain person by HC

E. Use 3H or 4H hard-lead pencils

(NOTE: Never use ink in keeping field notes.)

F. Record numbers and letters in the best form possible

G. Do not erase

(NOTE: If a mistake is made, mark through and record above.)

XIV. Calculating surveying problems (Assignment Sheets #2, #3, and #4)

A. Start with known BM1

(NOTE: This bench mark is usually used as 100.00 elevation.)

B. BS + last known elevation = HI

C. HI - FS = Elevation

D. Difference between total of BS and total of FS should equal the difference between the starting elevation and the last elevation

(NOTE: This will determine the degree of error or error of closure.)

INFORMATION SHEET

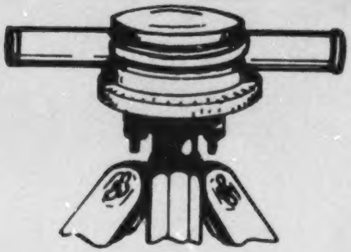
STA	BS	HI	FS	ELEV
BMI	3.00			100.00
		103.00		
TPI	4.00		8.50	94.50
		98.50		
BM2	5.00		6.00	92.50
		97.50		
TPI	8.00		3.00	94.50
		102.50		
BMI			2.50	100.00

$\Sigma BS = 20.00$ $\Sigma FS = 20.00$

Error of closure = 20.00 - 20.00 = 0.00

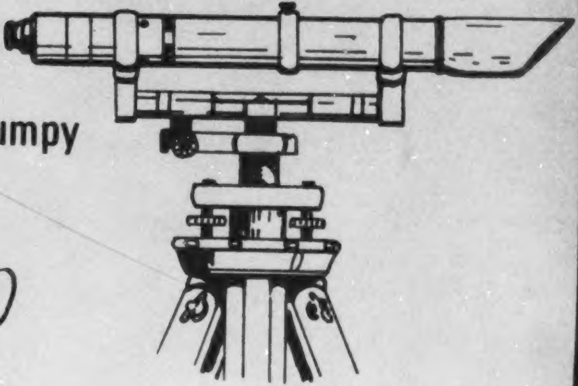
= 100.00 - 100.00 = 0.00

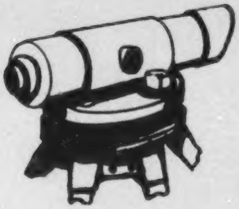
Types of Levels



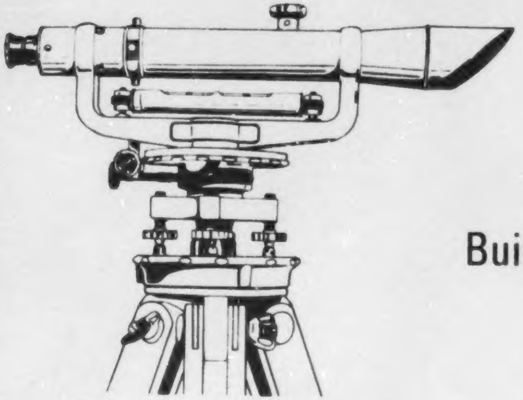
Turret

Engineer's Dumpy

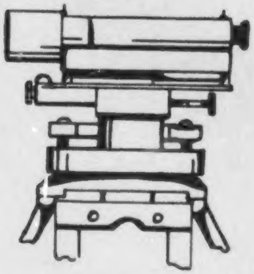




Engineer's Zeiss

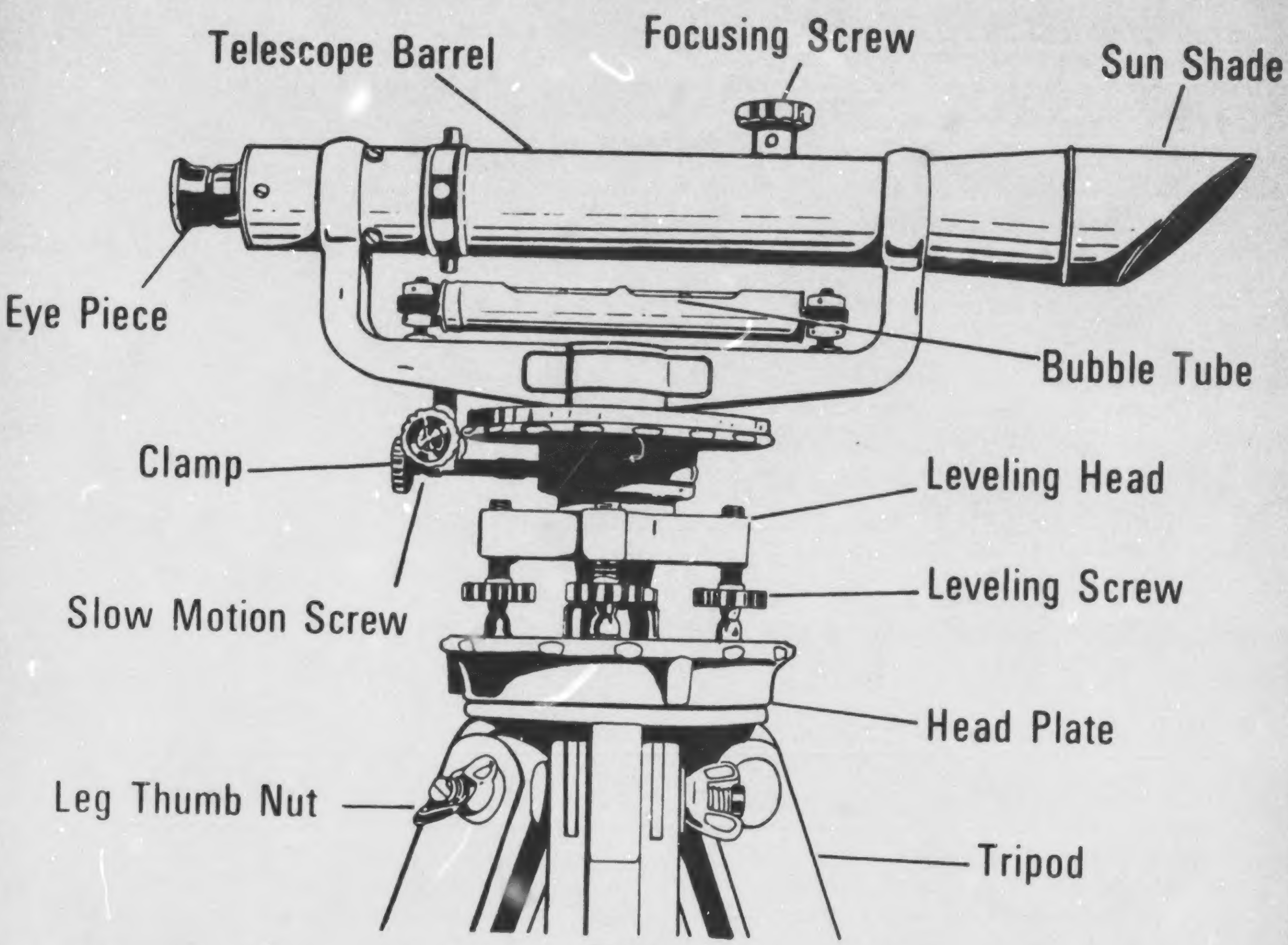


Builder's



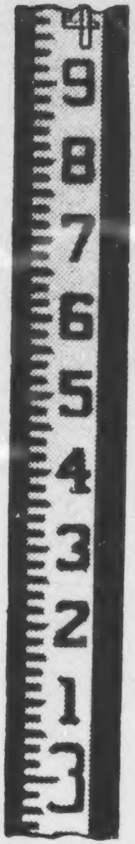
Engineer's Wild Tilting

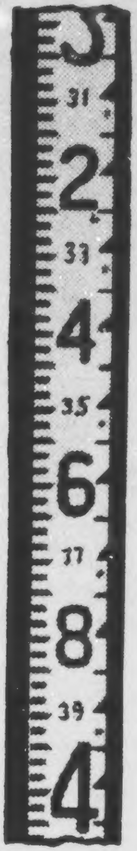
Parts of the Level



Self-Reading Rods

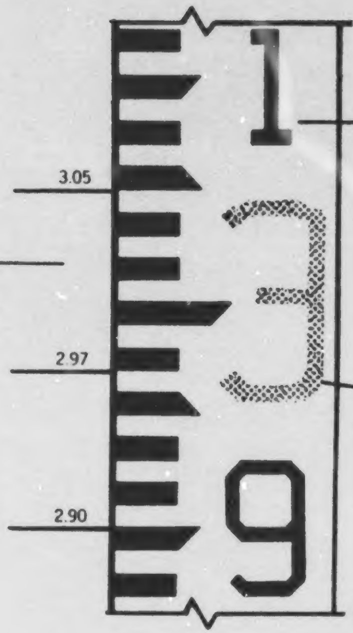
Positive
↑
Reading





Direct
↓
Reading

Reading the Rod



Tenths of Feet

(Black)

Hundredths of Feet

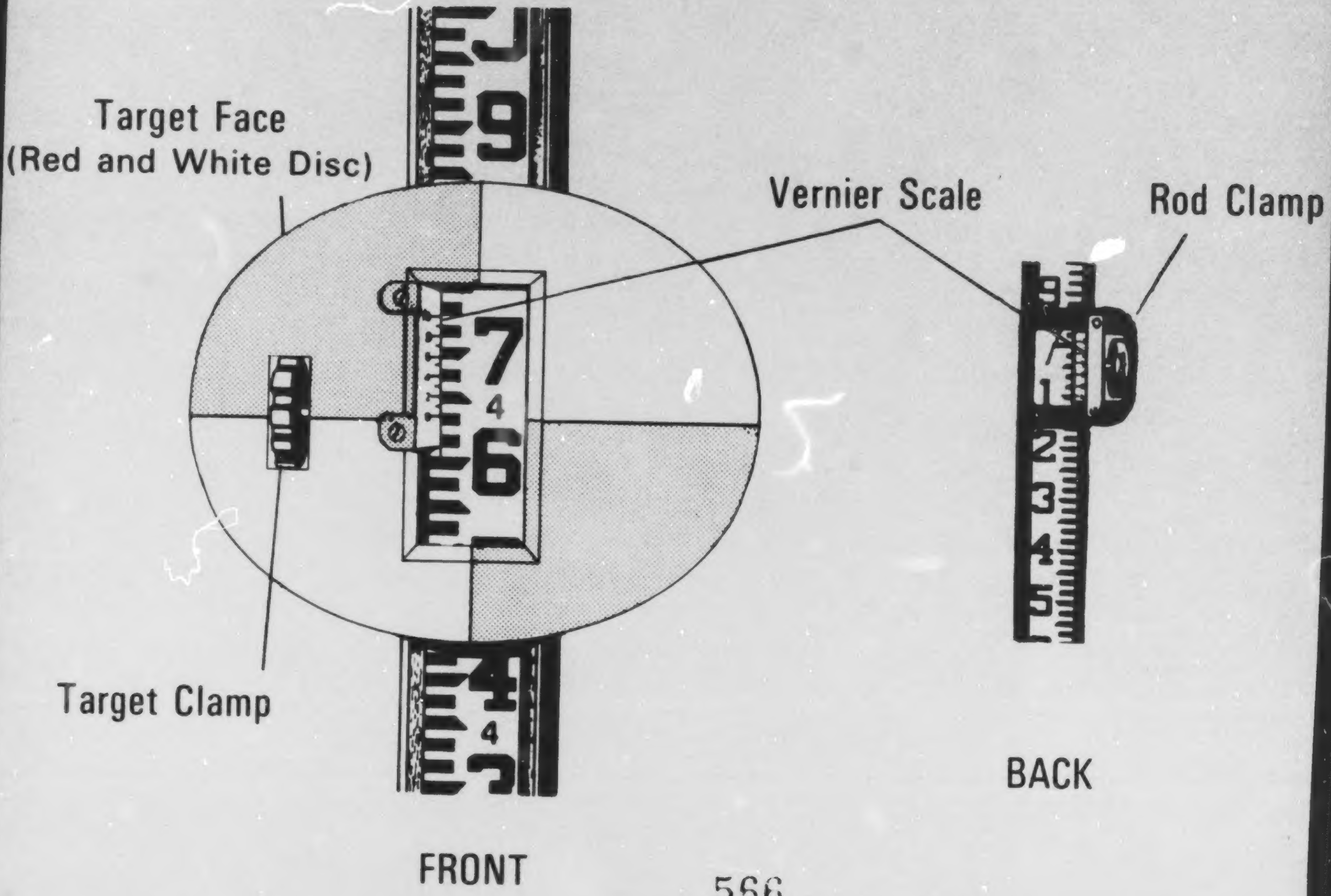
(Black and White)

Full Foot Numbers

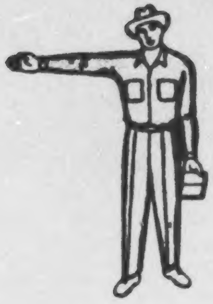
(Red)

NOTE: Vernier scale reads thousandths of feet

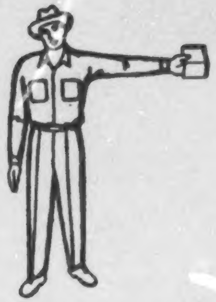
Parts of the Rod



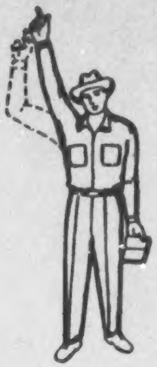
Hand Motions



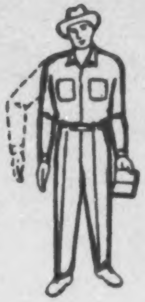
Move Rod to
the Right



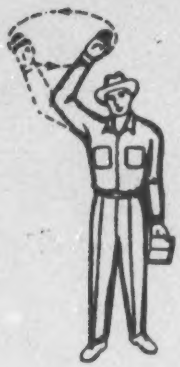
Move Rod to
the Left



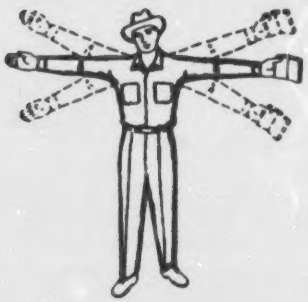
Move Up



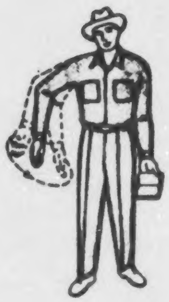
Move Down



Turning Point

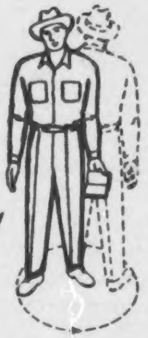


Observation Completed
or Move On
or Understood



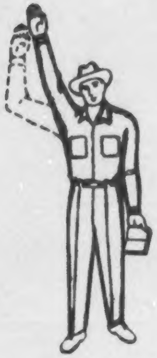
Come In

Step
Away
from
Inst.

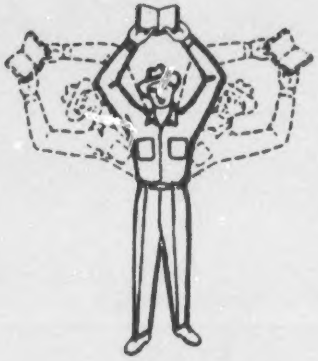


Walk
in
Tight
Circle

Wrong Face
or Check Clamp
or Rod Upside Down



Use
Long Rod

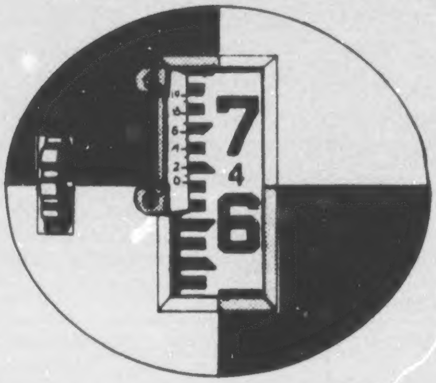


Wave Rod from
Side to Side

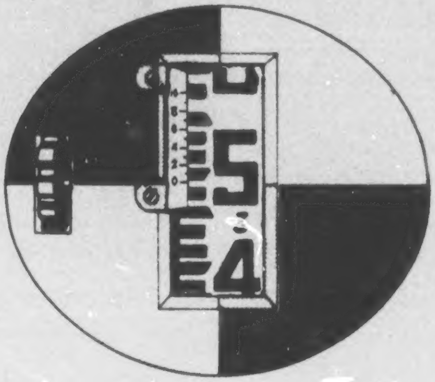
USING THE FARM LEVEL
UNIT I

ASSIGNMENT SHEET #1--READ THE SELF-READING ROD

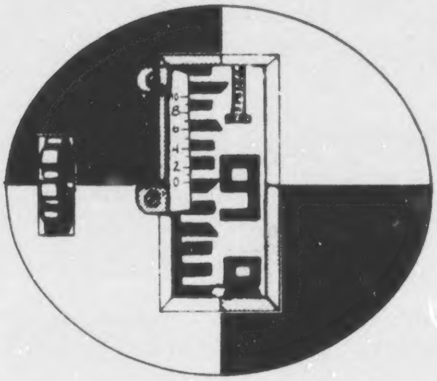
Read each of the illustrations below and record your results in the blanks provided.



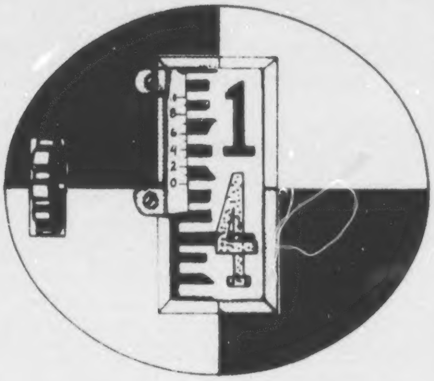
a. ______________________________



b. ______________________________



c. ______________________________



d. ______________________________

USING THE FARM LEVEL
UNIT I

ASSIGNMENT SHEET #2--CALCULATE FIELD DATA AND RECORD IN FIELD NOTEBOOK FORM

You have finished surveying a job and the following data was revealed.

BM1	BS	1.21	Elevation was 50.00
TP1	BS	6.20	FS 4.65
TP2	BS	4.82	FS 3.11
TP3	BS	2.03	FS 5.22
BM2			FS 3.16

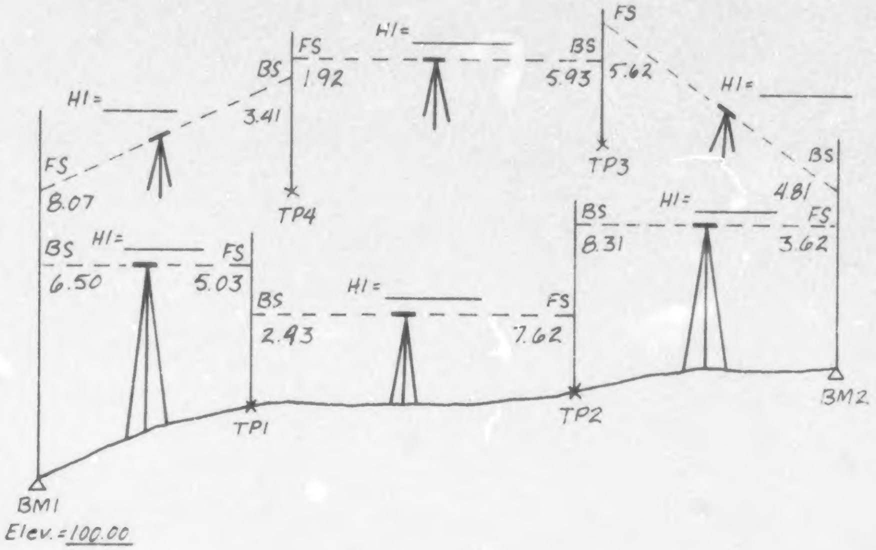
Using the data given, determine the elevation of BM2 and error of closure.

STA	BS	HI	FS	ELEV

USING THE FARM LEVEL
UNIT I

ASSIGNMENT SHEET #3--COMPLETE A DIFFERENTIAL LEVELING PROBLEM

Using the following readings, complete the field notes on the form below.



STA	BS	HI	FS	ELEV
BMI				
TPI				
TP2				
BM2				
TP3				
TP4				
BMI				

ΣBS= ______ ΣFS= ______

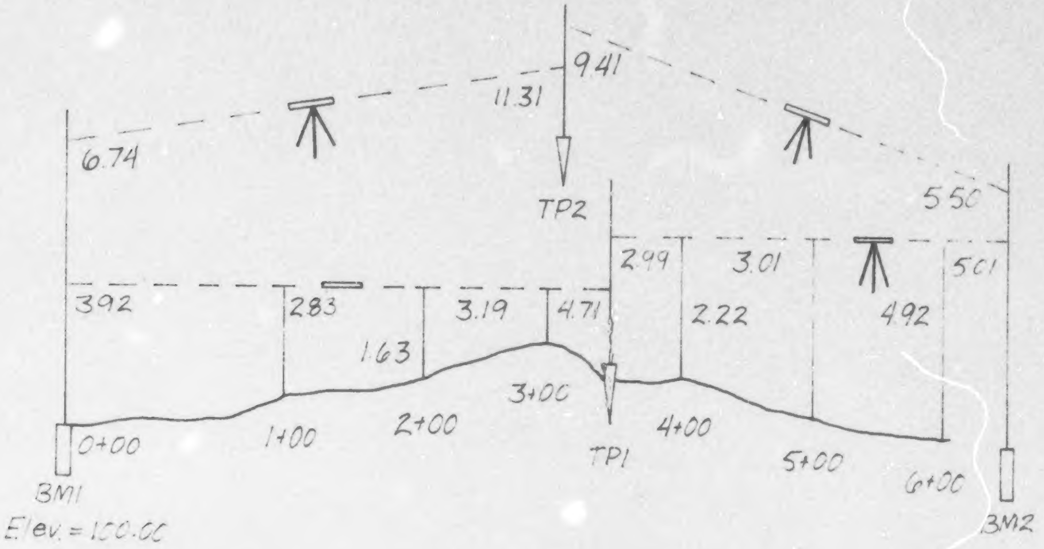
ΣFS-ΣBS= ______ - ______ = ______

CHECK: BMI(Begin) - BMI(End) = 571 ______ = ______

# USING THE FARM LEVEL
UNIT I

ASSIGNMENT SHEET #4--COMPLETE A PROFILE LEVELING PROBLEM

Using the readings for profile leveling, complete a set of field notes on the form below.



STA	BS	HI	FS	ELEV

USING THE FARM LEVEL
UNIT I

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1

a. 4.64

b. 3.49

c. 0.90

d. 4.05

Assignment Sheet #2

STA	BS	HI	FS	ELEV
BM1	1.21			50.00
		51.21		
TP1	6.20		4.65	46.56
		52.76		
TP2	4.82		3.11	49.65
		54.47		
TP3	3.03		5.22	49.25
		52.28		
BM2			3.16	49.12

$\Sigma BS = 15.26$ $\Sigma FS = 16.14$

$16.14 - 15.26 = 0.88$ $50.00 - 49.12 = 0.88$

Error = 0.88

Assignment Sheet #3

STA	BS	HI	FS	ELEV
BM1	6.50			100.00
		106.50		
TP1	2.93		5.03	101.47
		104.40		
TP2	8.31		7.62	96.78
		105.09		
BM2	4.81		3.62	101.47
		106.28		
TP3	5.93		5.62	100.66
		106.59		
TP4	3.41		1.92	104.67
		108.08		
BM1			8.07	100.01

ΣBS = 31.89　　ΣFS = 31.88

ΣBS - ΣFS = 31.89 - 31.88 = 0.01

CHECK: $\text{BM1}_{(\text{Begin})}$ - $\text{BM1}_{(\text{End})}$ = 100.01 - 100.00 = 0.01

Assignment Sheet #4

STA	BS	HI	FS	ELEV
BM1 0+00	3.92	103.92		100.00
1+00			2.83	101.09
2+00			1.63	102.29
3+00			3.19	100.73
TP1	2.99	102.20	(4.71)	99.21
4+00			2.22	99.98
5+00			3.01	99.13
6+00			4.92	97.28
BM2	5.50	102.69	(5.01)	97.19
TP2	11.31	104.59	(9.41)	93.28
BM1			(4.62)	99.97

ΣBS = 23.72　　ΣFS = 23.75

Error of closure = 23.75 - 23.72 = 0.03

100.00 - 99.97 = 0.03

USING THE FARM LEVEL
UNIT I

JOB SHEET #1--SET UP AND ADJUST THE FARM LEVEL

I. Tools and equipment

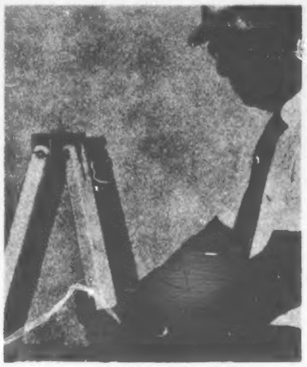
  A. Instrument

  B. Tripod

II. Procedure

  A. Grasp the two legs of the tripod that are nearest you and set the leg shoes in the ground about three feet apart (Figure 1)

FIGURE 1



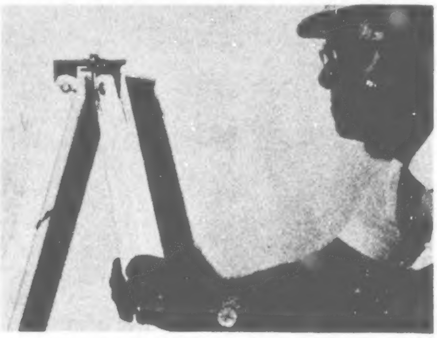
  B. Swing third leg out to form a triangle

  (NOTE: If the ground is not level, you may have to change position of tripod in order to keep head plate level. Always place two legs on downhill or unlevel side.)

  C. Tighten leg thumb nuts

  D. Check head plate to see if it is level (Figure 2)

FIGURE 2

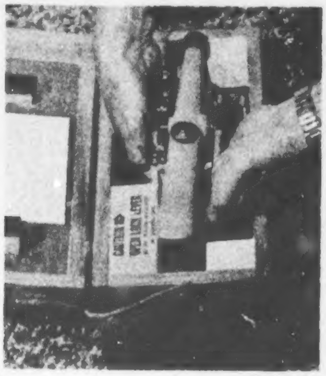


JOB SHEET #1

E. Remove instrument from carrying base by lifting the level bar (Figure 3)

(CAUTION: Never grasp the telescope barrel while removing instrument from carrying case.)

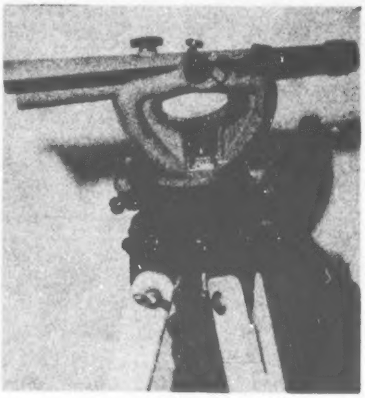
FIGURE 3



F. Attach instrument to head plate by screwing it down (Figure 4)

(CAUTION: Keep a firm grip on instrument until it is securely in position on tripod.)

FIGURE 4



G. Remove dust cap from front lens

(NOTE: The dust cap should be kept in place in order to protect the lens from dust or scratches.)

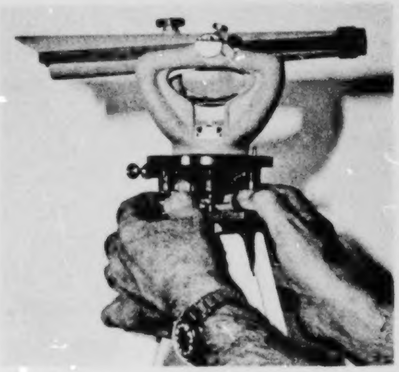
H. Attach sun shade to the instrument

JOB SHEET #1

I. Align telescope barrel directly over one pair of leveling screws (Figure 5)

(NOTE: The leveling screws will be used to level the instrument.)

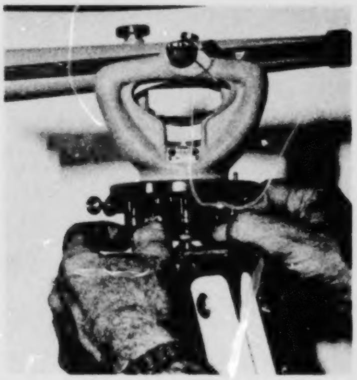
FIGURE 5



J. Rotate screws under the leveling head to bring bubble to the center of the leveling tube (Figure 6)

(NOTE: Move your thumbs in opposite directions.)

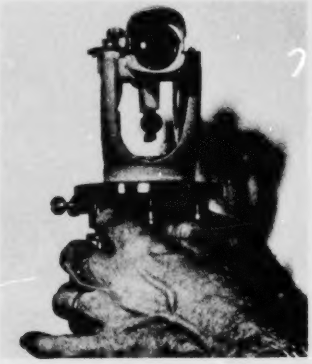
FIGURE 6



K. Check bubble to see if it is centered

L. Turn instrument clockwise through 90 degrees to align with the other pair of leveling screws (Figure 7)

FIGURE 7



JOB SHEET #1

M. Bring bubble to center of marks by rotating leveling screws

N. Turn instrument clockwise through 90 degrees to bring it parallel with first pair of leveling screws

O. Center bubble again

P. Turn instrument clockw[illegible]ugh 90 degrees to bring it parallel with second pair of leveling sc[illegible]s

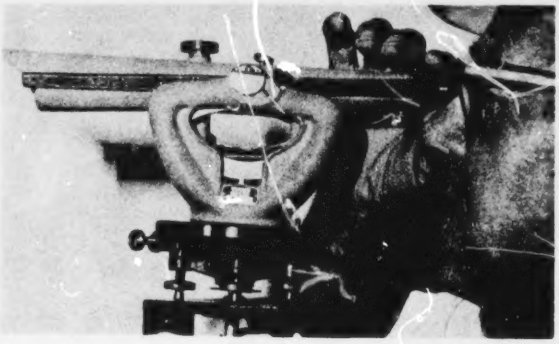
Q. Center bubble again

(NOTE: Bubble should stay in center regardless of what direction the telescope is pointing. If bubble does not, instrument is out of level and should be adjusted by competent personnel.)

R. Focus cross hairs so that they appear sharp and clear (Figure 8)

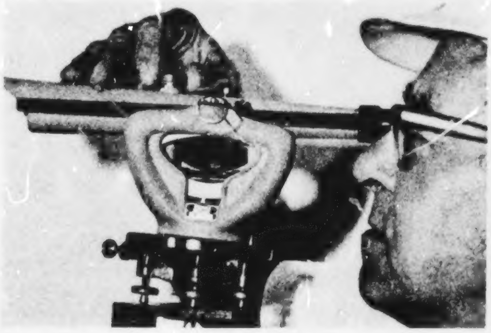
(NOTE: Focusing is accomplished by looking through the eye piece and by turning the eye piece ring until the cross hairs become sharp or "clear.")

FIGURE 8



S. Rotate the focusing screw to bring target into sharp focus (Figure 9)

FIGURE 9



JOB SHEET #1

(NOTE: When cross hairs and target are in sharp focus, you should be able to read a rod accurately. Always tie level shots back to starting bench mark to check for error in rod shots or in field notes.)

(CAUTION: After instrument is level, keep hands off tripod. Use the instrument only. If instrument creeps off level or is bumped, stop, reset tripod, relevel instrument, and start again from the last known good bench mark.)

USING THE FARM LEVEL
UNIT I

JOB SHEET #2--COMPLETE A DIFFERENTIAL LEVELING PROBLEM

I. Equipment and materials

- A. Instrument
- B. Tripod
- C. Rod
- D. Field-note paper
- E. Hard-lead pencil, 3H or 4H

II. Procedure

- A. Set up instrument
- B. Establish bench mark (BM1)

  (NOTE: Instructor should designate starting point.)

- C. Take backsight (BS) reading on bench mark
- D. Record reading in field notes (Figure 1)

  (NOTE: Assume starting elevation is 100.00. Be sure to read rod to two decimal places.)

FIGURE 1

STA	BS	HI	FS	ELEV
BM1	3.01			100.00
		103.01		

(NOTE: Backsight is added to elevation to obtain height of instrument.)

- E. Establish turning point (TP1)
- F. Take foresight reading

JOB SHEET #2

G. Record reading in field notes (Figure 2)

FIGURE 2

STA	BS	HI	FS	ELEV
BM1	3.01			100.00
		103.01		
TP1	2.60		3.86	99.15
		101.75		

1. Obtain HI between BM1 and TP1 by adding BS to elevation

   Example: 3.01 + 100.00 = 103.01

2. Obtain elevation at TP1 by subtracting FS from HI between BM1 and TP1

   Example: 103.01 - 3.86 = 99.15

3. Obtain HI between TP1 and TP2 by adding BS at TP1 to elevation at TP1

   Example: 99.15 + 2.60 = 101.75

H. Move instrument and set up again

I. Take backsight reading at TP1 and record in notes

J. Move rod to TP2 and take foresight reading

K. Record in notes (Figure 3)

FIGURE 3

STA	BS	HI	FS	ELEV
BM1	3.01			100.00
		103.01		
TP1	2.60		3.86	99.15
		101.75		
TP2	4.22		4.53	97.22

L. Move instrument and set up again

M. Take backsight on TP2 and record in notes

N. Move rod to BM2 and take foresight reading

JOB SHEET #2

O. Record reading in field notes (Figure 4)

FIGURE 4

STA	BS	HI	FS	ELEV
BM1	3.01			100.00
		103.01		
TP1	2.60		3.86	99.15
		101.75		
TP2	4.22		4.53	97.22
		101.44		
BM2	6.43		6.16	95.28

P. Repeat steps through TP3 and TP4 back to BM1

(NOTE: Completed field notes should look similar to Figure 5.)

STA	BS	HI	FS	ELEV
BM1	3.01			100.00
		103.01		
TP1	2.60		3.86	99.15
		101.75		
TP2	4.22		4.53	97.22
		101.44		
BM2	6.43		6.16	95.28
		101.71		
TP3	3.85		4.44	97.27
		101.12		
TP4	5.11		2.96	98.16
		103.27		
BM1			3.30	99.97

$\Sigma BS = \underline{25.22} \qquad \Sigma FS = \underline{25.25}$

$\underline{\Sigma FS\text{-}\Sigma BS} = \underline{25.25} - \underline{25.22} = \underline{0.03}$

CHECK: $BM1_{(Begin)} - BM1_{(End)}$ CHECK

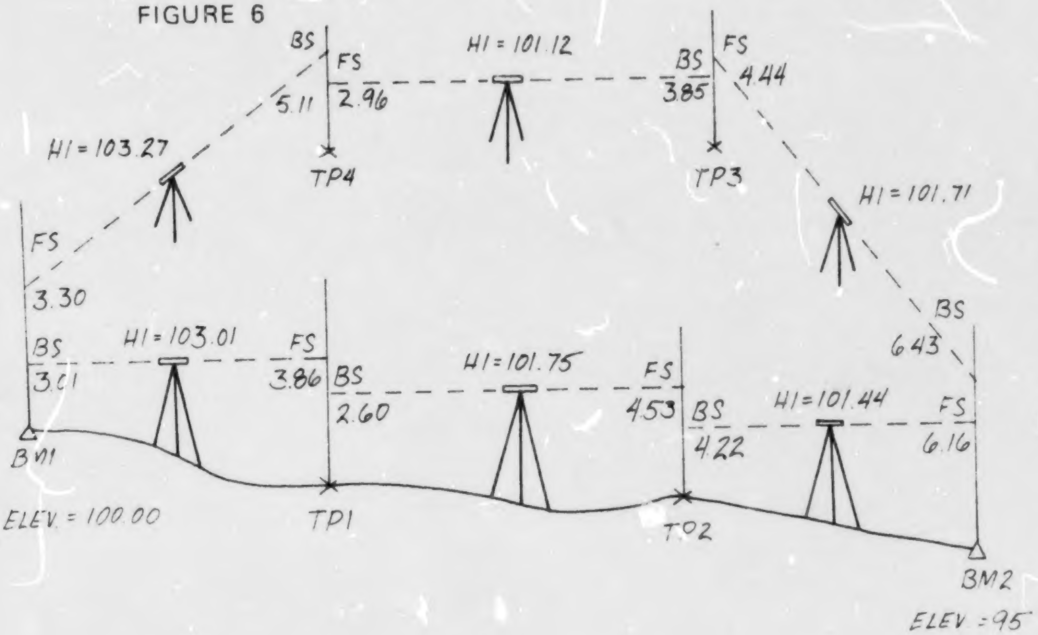
$\underline{100.00} - \underline{99.97} = \underline{0.03}$

JOB SHEET #2

Q. Determine error of closure

(NOTE: Differential leveling problem should have looked similar to Figure 6. For additional practice in recording field notes, see Assignment Sheet #3.)

FIGURE 6



USING THE FARM LEVEL
UNIT I

JOB SHEET #3--COMPLETE A PROFILE LEVELING PROBLEM

I. Tools and equipment

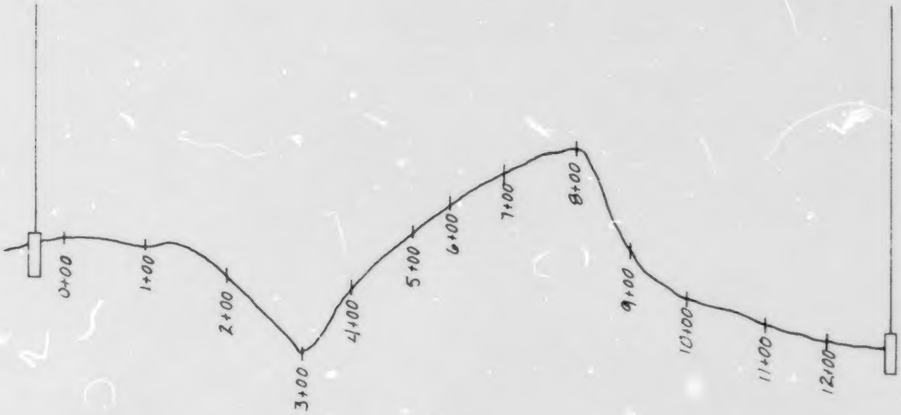
- A. Instrument
- B. Rod
- C. Tape, 100 ft steel
- D. Field note paper
- E. Pencil
- F. Stakes, 2" x 2" x 12"

II. Procedure

- A. Establish center line of area to be profiled
- B. Set stakes at a fixed distance along line (Figure 1)

  (NOTE: Common distances may be 25', 50', or 100' depending on irregularity of ground.)

FIGURE 1



- C. Set up instrument
- D. Take BS reading on BM1 and record in field notes

  (NOTE: Description of location of BM1 should be recorded in right hand column of notes.)

JOB SHEET #3

E. Move rod to first stake designated as 0+00 or starting point of profile and take a foresight reading

(NOTE: All readings at stake location will be recorded as FS readings until a TP is established.)

F. Continue readings at stakes and record as FS readings until it is necessary to move the instrument

G. Establish a turning point before moving instrument

H. Move instrument and set up

I. Take BS on TP1 and record in field notes

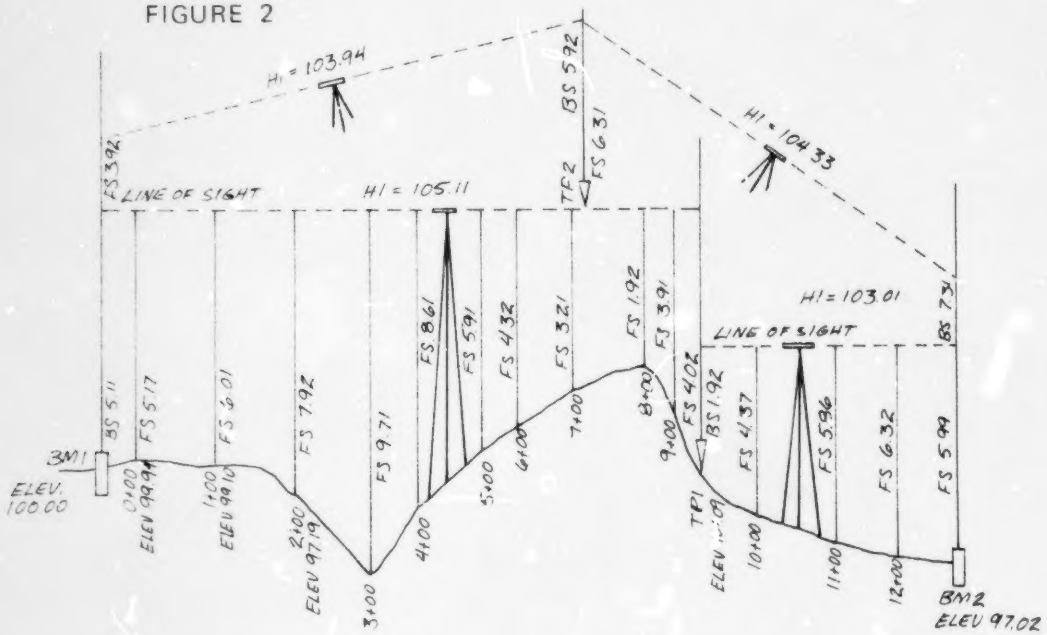
J. Take FS readings at stake until profile is complete or it is necessary to establish another turning point and move the instrument

K. Continue until BM2 is reached

L. Make a return check to BM1

(NOTE: See sample problem in Figure 2 and sample field notes in Figure 3 for a profile leveling exercise. For a practice exercise, complete Assignment Sheet #4.)

FIGURE 2



JOB SHEET #3

PROFILE LEVELING South 40 acres					Jan. 15, 1978 Braker Fair, clear, calm farm
STA	BS	HI	FS	ELEV	Comments
BM1	5.11	105.11		100.00	Stake in SE corner
0+00			5.17	99.94	
1+00			6.01	99.10	
2+00			7.92	97.19	
3+00			9.71	95.40	
4+00			8.61	96.50	
5+00			5.91	99.20	
6+00			4.32	100.79	
7+00			3.21	101.90	
8+00			1.92	103.19	
9+00			3.91	101.20	
TP1	1.92	103.01	(4.02)	101.09	Top of stake
10+00			4.37	98.64	
11+00			5.86	97.15	
12+00			6.32	96.69	
BM2	7.31	104.33	(5.99)	97.02	
TP2	5.92	103.94	(6.31)	98.02	
BM1			(3.92)	100.02	

ΣBS = 20.26 ΣFS = 20.24

Error of closure: 20.26 - 20.24 = 0.02

100.02 - 100.00 = 0.02

(NOTE: To determine error of closure, total all BS then total all FS at TP or BM. In recording field notes, the FS at TP or BM should be in parentheses.)

USING THE FARM LEVEL
UNIT I

TEST

NAME ______________________________ SCORE ______________

1. Match the terms on the right to the correct definitions on the left by placing the appropriate numbers in the blanks provided.

_____a. Elevation of the level line of sight or of the cross hairs in the telescope with respect to the bench mark

_____b. Level line through the instrument, as viewed by the eye; place where vertical hair crosses the horizontal hair

_____c. Method of determining the difference in elevation between two points

_____d. Permanent point of known or assumed elevation from which leveling surveys are started

_____e. Book used to keep surveying information

_____f. Rod reading taken on a point of known elevation

_____g. Rod used in leveling; normally graduated in tenths and hundredths of a foot

_____h. Solid location (usually a temporary stake) on which a foresight is taken, the instrument moved, and then a backsight taken to determine a new HI

_____i. Process by which the elevation of spaced grid points in a field are determined

_____j. Method of determining the elevation of a series of points at measured intervals along a line

_____k. Rod reading taken on a point of unknown elevation

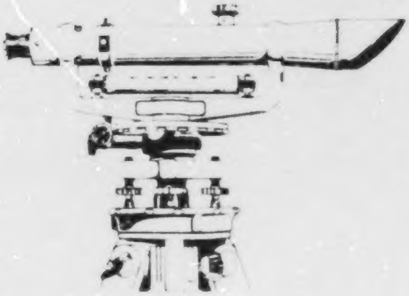
_____l. Rod that is read through the instrument by the instrument person

1. Bench mark (BM)
2. Foresight (FS)
3. Backsight (BS)
4. Height of instrument (HI)
5. Turning point (TP)
6. Field notebook
7. Line of sight
8. Self-reading rod
9. Differential leveling
10. Profile leveling
11. Topographic leveling
12. Level rod
13. Contour line
14. Error of closure

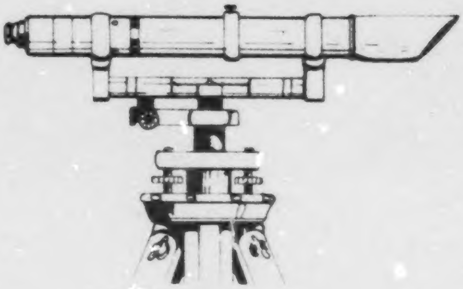
______m. Line connecting points on the land surface which have the same elevation

______n. Difference between original BM1 elevation and the calculated BM1 elevation after a return check, if they fail to agree

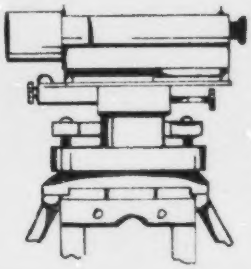
2. Identify the following types of levels.



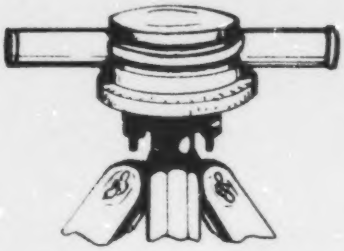
a. ______________________



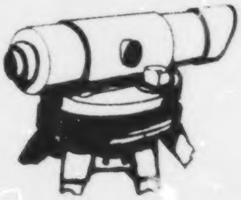
b. ______________________



c. ______________________

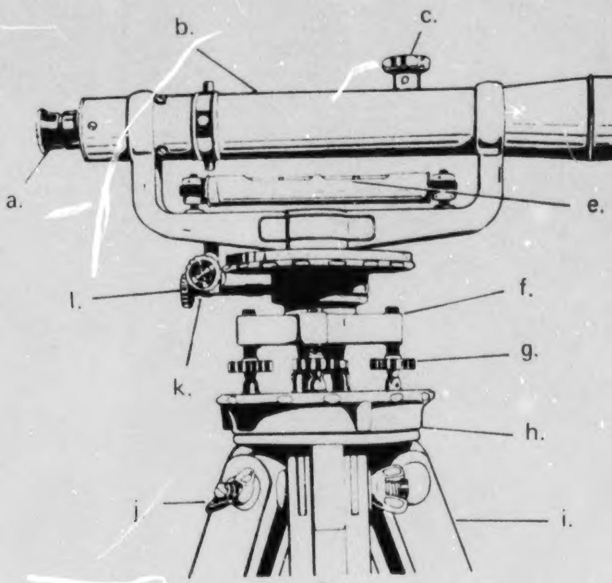


d. ______________________



e. ______________________

3. Identify the parts of the farm level.



a. ____________________

b. ____________________

c. ____________________

d. ____________________

e. ____________________

f. ____________________

g. ____________________

h. ____________________

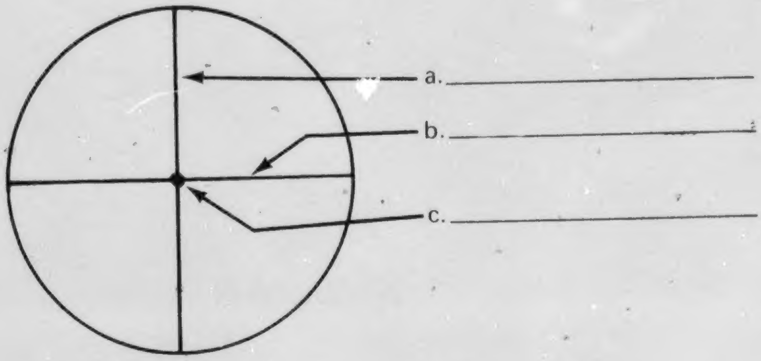
i. ____________________

j. ____________________

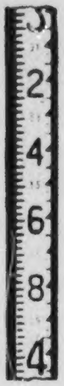
k. ____________________

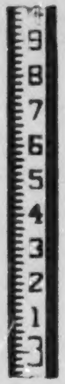
l. ____________________

4. Identify the cross hairs in the telescope.



5. Identify the following types of self-reading rods.



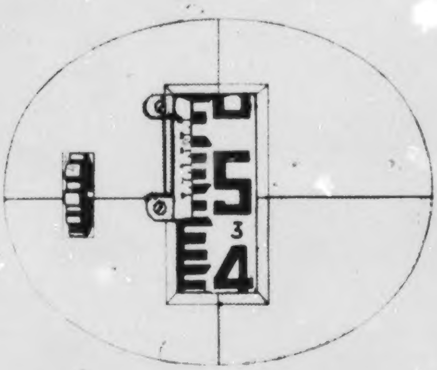


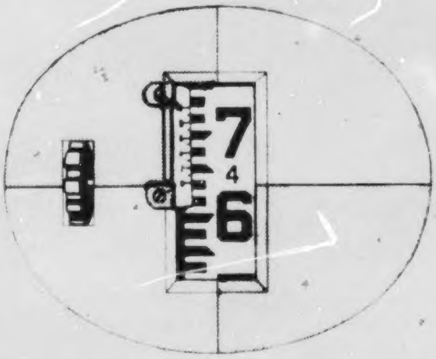
a. ______________________ b. ______________________

6. Match the markings on the farm level on the right to the correct graduations on the left. Place the appropriate numbers in the blanks provided.

______a.	Designate feet	1.	Red numbers
______b.	Reads thousandths of feet	2.	Black numbers
______c.	Indicate tenths of feet	3.	Black and white marks
______d.	Show hundredths of feet	4.	Vernier scale

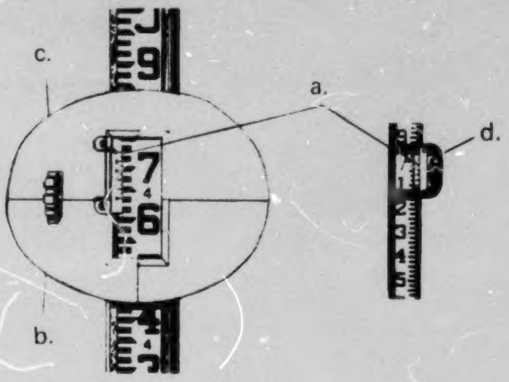
7. Read the following self-reading rods, placing the correct readings in the blanks provided.





a. ______________________ b. ______________________

8. Identify the parts of the rod.



a. ____________________ c. ____________________

b. ____________________ d. ____________________

9. Match the parts of the rod on the right to their uses on the left. Place the appropriate numbers in the blanks provided.

_____a. Holds the target in place

_____b. Holds the rod when extended

_____c. Is used for certain types of readings

_____d. Enables reading to the nearest thousandth of a foot

1. Target face
2. Target clamp
3. Rod clamp
4. Vernier scale

10. Select from the list below common errors in measurement. Place an "X" in the appropriate blank.

_____a. Tape pulled tight enough

_____b. Tape not pulled tight enough

_____c. Reading or recording wrong numbers

_____d. Temperature or climatic condition

_____e. Tape not in proper alignment

_____f. Plumb bob not used when measuring on slope

11. Select from the list below rules for care of the farm level. Place an "X" in the appropriate blanks.

______a. Protect against shock and vibration during transport

______b. Store instrument in a cool, damp area

______c. Keep in box except when in use

______d. Place lens and tripod cap in box after removing from instrument

______e. Use a rough cloth when cleaning lenses

______f. Attach instrument onto tripod carefully and firmly before moving tripod

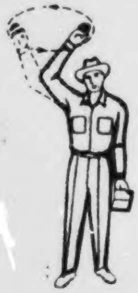
______g. Use sun shade regardless of the weather

______h. Leave instrument attached to tripod when traveling from job to job

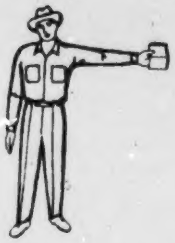
______i. Clean lenses with soft tissue

______j. Do not set up instrument in the shade and move to sun without releasing leveling screws

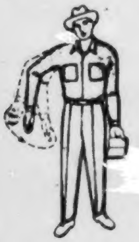
12. Identify the hand motions used by the instrument person to guide the target person.



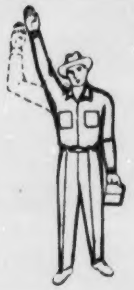
a. ______________________________



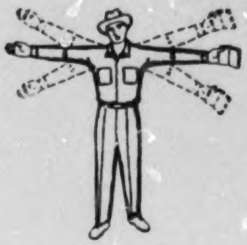
b. ______________________________

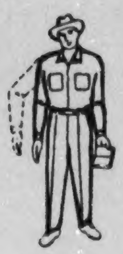


c. ______________________________

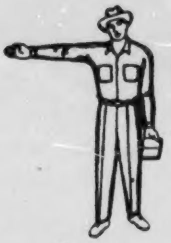


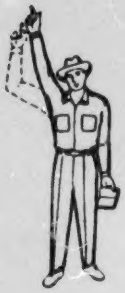
d. ______________________________



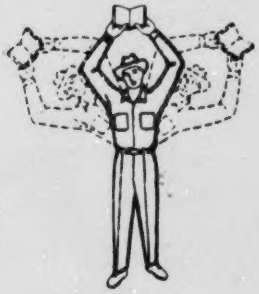


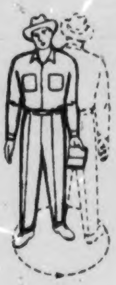
e. ______________________________ f. ______________________________





g. ______________________________ h. ______________________________





i. ______________________________ j. ______________________________

13. Select from the list below points to follow in keeping good field notes. Place an "X" in the appropriate blanks.

______a. Reserve last five pages for index

______b. Number of pages in upper left-hand corner

______c. Write descriptive title at top of first page for each job

______d. Record names of survey party at top of left-hand side _____e. Use 3H or 4H hard-lead pencil

_____f. Record numbers and letters in the best form possible

_____g. Do not erase

14. Calculate problems and record the results in the field notebook

15. Demonstrate the ability to:

    a. Set up and adjust the farm level.

    b. Complete a differential leveling problem.

    c. Complete a profile leveling problem.

    (NOTE: If activities 14 and 15 have not been accomplished prior to the test, ask the instructor when they should be completed.)

USING THE FARM LEVEL
UNIT I

ANSWERS TO TEST

1. a. 4
   b. 7
   c. 9
   d. 1
   e. 6
   f. 3
   g. 12
   h. 5
   i. 11
   j. 10
   k. 2
   l. 8
   m. 13
   n. 14

2. a. Builder's
   b. Engineer's dumpy
   c. Engineer's wild tilting
   d. Turret
   e. Engineer's Zeiss

3. a. Eye piece
   b. Telescope barrel
   c. Focusing screw
   d. Sun shade
   e. Bubble tube
   f. Leveling head
   g. Leveling screw
   h. Head plate
   i. Tripod

j. Leg thumb nut
k. Slow motion screw
l. Clamp

4. a. Vertical
   b. Horizontal
   c. Line of sight

5. a. Direct reading
   b. Positive reading

6. a. 1
   b. 4
   c. 2
   d. 3

7. a. 3.49
   b. 4.64

8. a. Vernier scale
   b. Target clamp
   c. Target face
   d. Rod clamp

9. a. 2
   b. 3
   c. 1
   d. 4

10. b, c, e, f

11. a, c, d, f, g, i, j

12. a. Turning point
    b. Move rod to the left
    c. Come in

d. Use long rod

e. Observation completed; move on; understood

f. Move down

g. Move rod to the right

h. Move up

i. Wave rod from side to side

j. Wrong face; check clamp; rod upside down

13. c, e, f, g

14. Evaluated to satisfaction of instructor

15. Evaluated to satisfaction of instructor

OVERHAULING SMALL GASOLINE ENGINES
UNIT II

UNIT OBJECTIVE

After completion of this unit, the student should be able to identify parts of an engine and identify special tools needed for engine overhaul. The student should be able to read a nameplate, describe differences between two-stroke and four-stroke cycle engines, and read a micrometer. The student should be able to complete an engine inspection chart and disassemble, inspect, replace rings, reface valves and valve seats, and reassemble small gasoline engines. This knowledge will be evidenced by completion of assignment sheets, job sheets, and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

1. Match terms associated with overhauling small gasoline engines to the correct definitions.
2. Identify parts of a small horizontal shaft gasoline engine.
3. Identify special tools needed in overhauling small gasoline engines.
4. Identify the basic operating positions of the small gasoline engine.
5. List items found on an engine nameplate.
6. State the importance of being able to read an engine nameplate.
7. Describe differences between two-stroke and four-stroke cycle engines.
8. Identify the strokes of a four-stroke cycle engine and of a two-stroke cycle engine.
9. Identify parts of a valve.
10. Identify kinds of rings.
11. Match each kind of ring to its specific purpose.
12. Identify parts of a plain micrometer.
13. Read the plain micrometer.
14. Complete engine inspection chart.

15. Demonstrate the ability to:

    a. Disassemble, inspect, and reassemble a four-stroke cycle engine.

    b. Disassemble, inspect, and reassemble a two-stroke cycle engine.

    c. Reface valves and valve seats.

    d. Replace rings.

OVERHAULING SMALL GASOLINE ENGINES
UNIT II

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

- A. Provide student with objective sheet.
- B. Provide student with information, assignment, and job sheets.
- C. Make transparencies.
- D. Discuss unit and specific objectives.
- E. Discuss information and assignment sheets.
- F. Demonstrate and discuss procedures outlined on job sheets.

  (NOTE: Provide each student with the opportunity to complete additional overhaul of engines.)
- G. Secure examples of burned valves for class use.
- H. Encourage student to bring a small engine for class work.
- I. Play concentration game with terms and definitions.
- J. Give test.

II. Instructional materials:

- A. Objective sheet
- B. Information sheet
- C. Transparency masters
  1. TM 1--Parts of a Small Horizontal Shaft Gasoline Engine
  2. TM 2--Parts of a Small Vertical Shaft Gasoline Engine
  3. TM 3--Special Tools
  4. TM 4--Special Tools (Continued)
  5. TM 5--Engine Operating Positions
  6. TM 6--Nameplate Information
  7. TM 7--Strokes of a Four-Stroke Cycle Engine
  8. TM 8--Strokes of a Two-Stroke Cycle Engine

        9. TM 9--Kinds of Rings
        10. TM 10--Micrometer Parts
        11. TM 11--Reading a Micrometer
        12. TM 12--Reading a Micrometer (Continued)

    D. Assignment sheets

        1. Assignment Sheet #1--Read the Plain Micrometer
        2. Assignment Sheet #2--Complete Engine Inspection Chart

    E. Answers to assignment sheets

    F. Job sheets

        1. Job Sheet #1--Disassemble, Inspect, and Reassemble a Four-Stroke Cycle Engine
        2. Job Sheet #2--Disassemble, Inspect, and Reassemble a Two-Stroke Cycle Engine
        3. Job Sheet #3--Reface Valves and Valve Seats
        4. Job Sheet #4--Replace Rings

    G. Test

    H. Answers to test

III. Unit references:

    A. Turner, Howard J. *Small Engines: Care, Operation, Maintenance, and Repair.* Vol. I. Athens, Georgia: American Association for Vocational Instructional Materials, 1971.

    B. Turner, Howard J. *Small Engines: Maintenance and Repair.* Vol. II. Athens, Georgia: American Association for Vocational Instructional Materials, 1974.

    C. *Briggs and Stratton Repair Instructions III.* Milwaukee, Wisconsin: Briggs and Stratton Corp., 1964.

    D. *General Theories of Operation.* Milwaukee, Wisconsin: Briggs and Stratton Corp., 1964.

    E. Armstrong, Ivan J. *Auto Mechanics.* Vol. I. Stillwater: Oklahoma State Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, 1977.

    F. *Small Engine Service Manual.* 11th ed. Kansas City: Technical Publication Div./Intertec Publishing Corp., 1976.

OVERHAULING SMALL GASOLINE ENGINES
UNIT II

INFORMATION SHEET

I. Terms and definitions

A. Camshaft--Shaft containing lobes or cams to operate the engine's valves

B. Carburetor--Device for automatically mixing fuel in the proper proportions with air to produce a combustible gas

C. Combustion--Burning process

D. Combustion chamber--Area of the cylinder above the piston with the piston at top dead center

E. Compression--Reduction in volume of fuel-air mixture within the cylinder

F. Condenser--Device for temporarily collecting and storing an overflow of electrical current for later discharge

G. Conductor--Material along or through which electricity will flow with slight resistance

H. Connecting rod--Rod that connects the piston to the crankshaft

I. Crankcase--Housing in which the crankshaft and many other parts of the engine operate

J. Crankshaft--Main shaft of the engine which, in conjunction with the connecting rods, changes the reciprocating motion of the pistons into rotary motion

K. Cylinder--Hole in engine block which receives a piston; sometimes referred to as *bore* or *barrel*

L. Cylinder block--Largest single piece of an engine; basis or main mass of metal in which the cylinders are bored or placed

M. Cylinder head--Detachable portion of an engine fastened securely to the cylinder block which contains all or a portion of the combustion chamber

N. Exhaust pipe--Pipe connecting the engine to the muffler to conduct the exhaust gases away from the engine

O. Exhaust valve--Device which permits the spent fuel-air mixture to leave the combustion chamber

INFORMATION SHEET

P. Gasket--Anything used as a packing, such as a nonmetallic substance, placed between two metal surfaces to act as a seal

Q. Governor--Control device used to regulate engine speed

R. Ignition system--Means for igniting the fuel in the combustion chamber; includes spark plugs, wires, ignition coil, points, condenser, and source of electrical current

S. Intake valve--Valve which permits the fuel-air mixture to enter the combustion chamber or cylinder and then seals the exit

T. Piston--Cylindrical part closed at one end which is connected to the crankshaft by the connecting rod

U. Piston head--Part of the piston above the rings

V. Piston pin--Pin that goes through the small end of the connecting rod which also passes through the piston walls; also known as *wrist pin*

W. Piston ring--Expanding ring placed in the groove of the piston to provide a seal to prevent the passage of fuel-air mixture past the piston

X. Score--Scratch, ridge, or groove marring a finished surface

Y. Spark--Electrical current possessing sufficient pressure to jump through the air from one conductor to another

Z. Spark gap--Space between the electrodes of a spark plug through which the spark jumps

AA. Spark plug--Device inserted into the combustion chamber of an engine to produce the spark to ignite the compressed fuel-air mixture

BB. Stroke--Distance piston travels inside cylinder

II. Parts of a small gasoline engine (Transparencies 1 and 2)

A. Engine block

B. Piston

C. Connecting rod

D. Crankshaft

E. Camshaft

F. Push rod or tappet

G. Valve

INFORMATION SHEET

H. Carburetor

I. Muffler

J. Cylinder head

K. Valve guide

L. Valve spring

M. Oil fill plug

N. Crankcase

O. Piston rings

P. Cylinder

Q. Piston pin

R. Flywheel shroud

S. Spark plug

T. Plug wire

U. Fuel tank

III. Special tools (Transparencies 3 and 4)

A. Valve spring compressor

B. Micrometer

C. Valve seat refacer

D. Valve seat cutter

E. Small hole gauge

F. Hone

G. Ring expander

H. Ring compressor

I. Flywheel holder

J. Ridge reamer

K. Valve guide reamer

L. Starter clutch wrench

INFORMATION SHEET

IV. Basic operating positions of small gasoline engines (Transparency 5)

   A. Vertical crankshaft

   B. Horizontal crankshaft

   C. Multiposition crankshaft

      Example: Chain saw

V. Items found on an engine nameplate (Transparency 6, Assignment Sheet #2)

   A. Make of engine

   B. Model number or name of engine

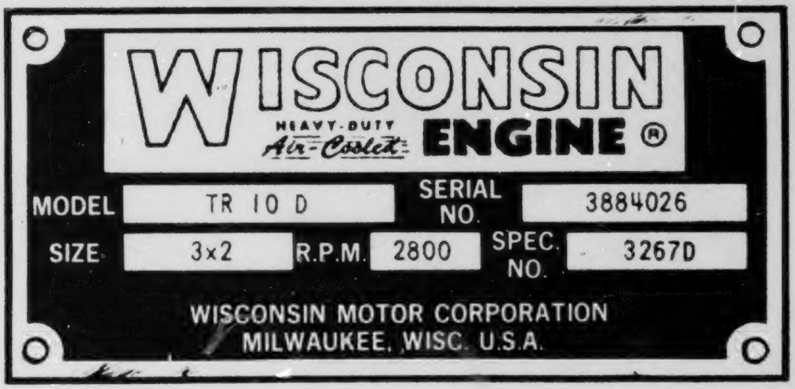
   C. Serial number

   D. Type number

   E. Specification number

   F. Size

   G. rpm



MODEL TR 10 D
SERIAL NO. 3884026
SIZE 3x2
R.P.M. 2800
SPEC. NO. 3267D

VI. Importance of reading engine nameplate--Provides information for replacement parts or service

VII. Differences between two-stroke and four-stroke cycle engines

   A. Number of power strokes per crankshaft revolution

   B. Method of getting fuel-air mixture into combustion chamber

   C. Method of exhaust

   D. Method of lubricating the internal parts

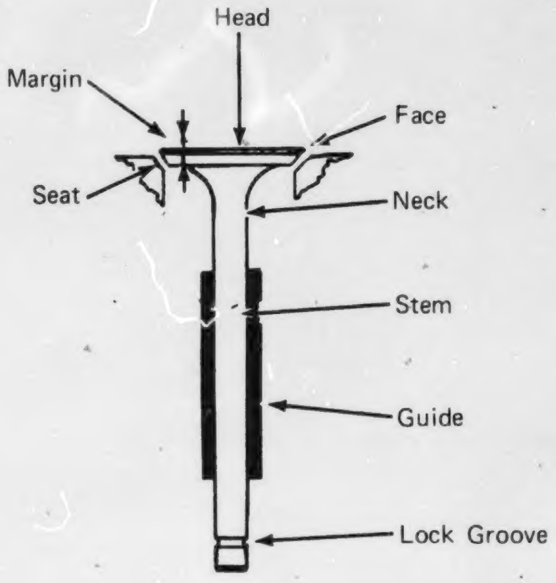
INFORMATION SHEET

VIII. Strokes of a four-stroke cycle engine and two-stroke cycle engine (Transparencies 7 and 8)

- A. Four-stroke
  - 1. Intake
  - 2. Compression
  - 3. Power
  - 4. Exhaust
- B. Two-stroke
  - 1. Intake-Compression
  - 2. Power-Exhaust

IX. Parts of a valve

- A. Head
- B. Face
- C. Seat
- D. Margin
- E. Neck
- F. Stem
- G. Guide
- H. Lock groove



INFORMATION SHEET

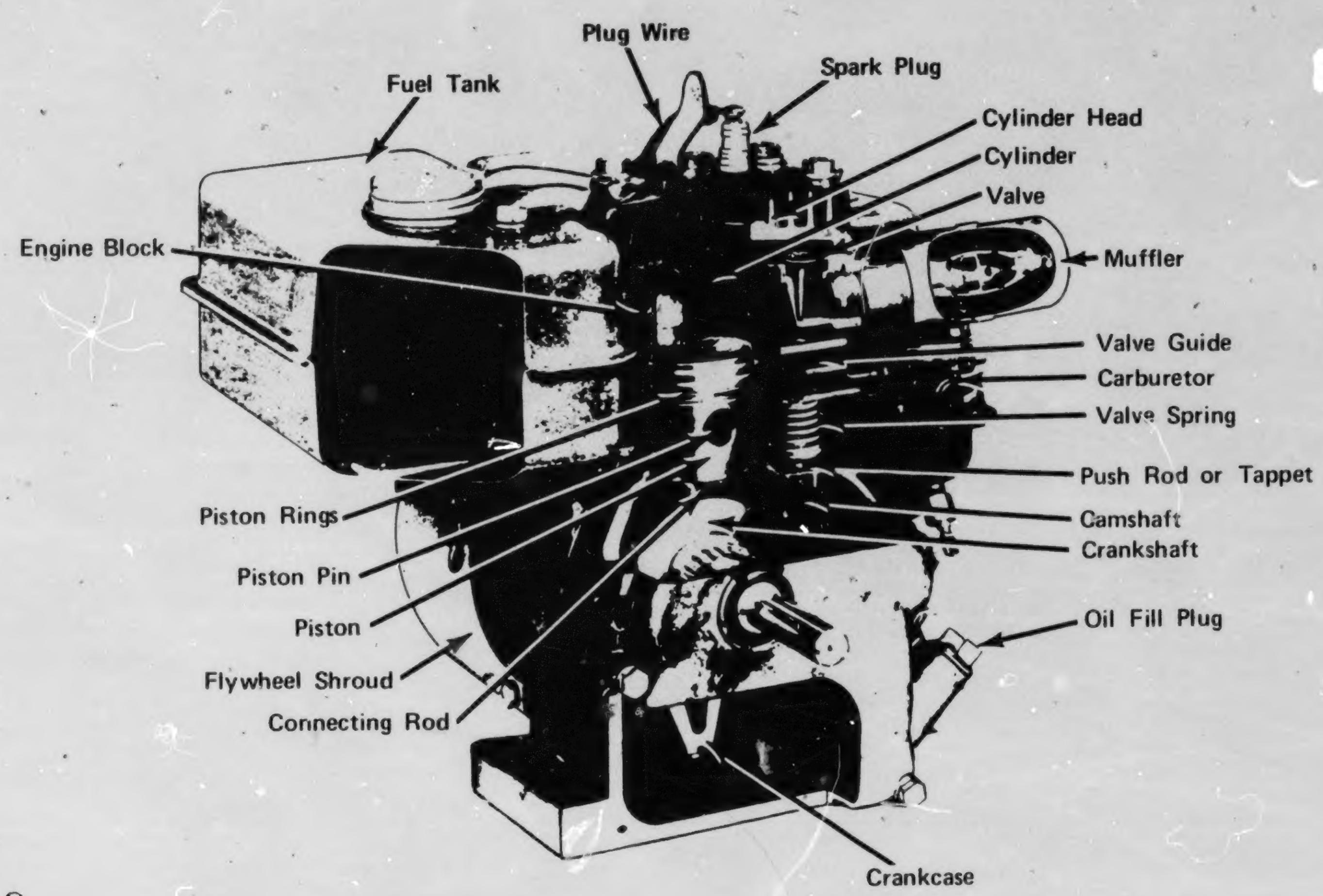
- X. Kinds of rings (Transparency 9)
  - A. Compression rings
  - B. Oil scraper rings
  - C. Oil control rings
- XI. Purposes of rings
  - A. Compression rings--Make a tight seal against cylinder wall
  - B. Oil scraper rings--Wipe excess oil off cylinder wall as piston moves down

    (NOTE: This prevents the oil from bypassing the ring, entering the combustion chamber, and being burned.)
  - C. Oil control rings--Regulate the amount of oil going to the compression rings and cylinder wall
- XII. Parts of a plain micrometer (Transparency 10)
  - A. Anvil
  - B. Spindle
  - C. Lock
  - D. Sleeve
  - E. Ratchet stop
  - F. Thimble
  - G. Frame
- XIII. Read a plain micrometer (Transparencies 11 and 12, Assignment Sheet #1)
  - A. Each numbered graduation on the sleeve represents one hundred thousandths of an inch (0.100")
  - B. Each small graduation on the sleeve between the numbered graduations represents twenty-five thousandths of an inch (0.025")
  - C. Each graduation found on the thimble represents one thousandth of an inch (0.001")
  - D. Total reading is found by adding the three values

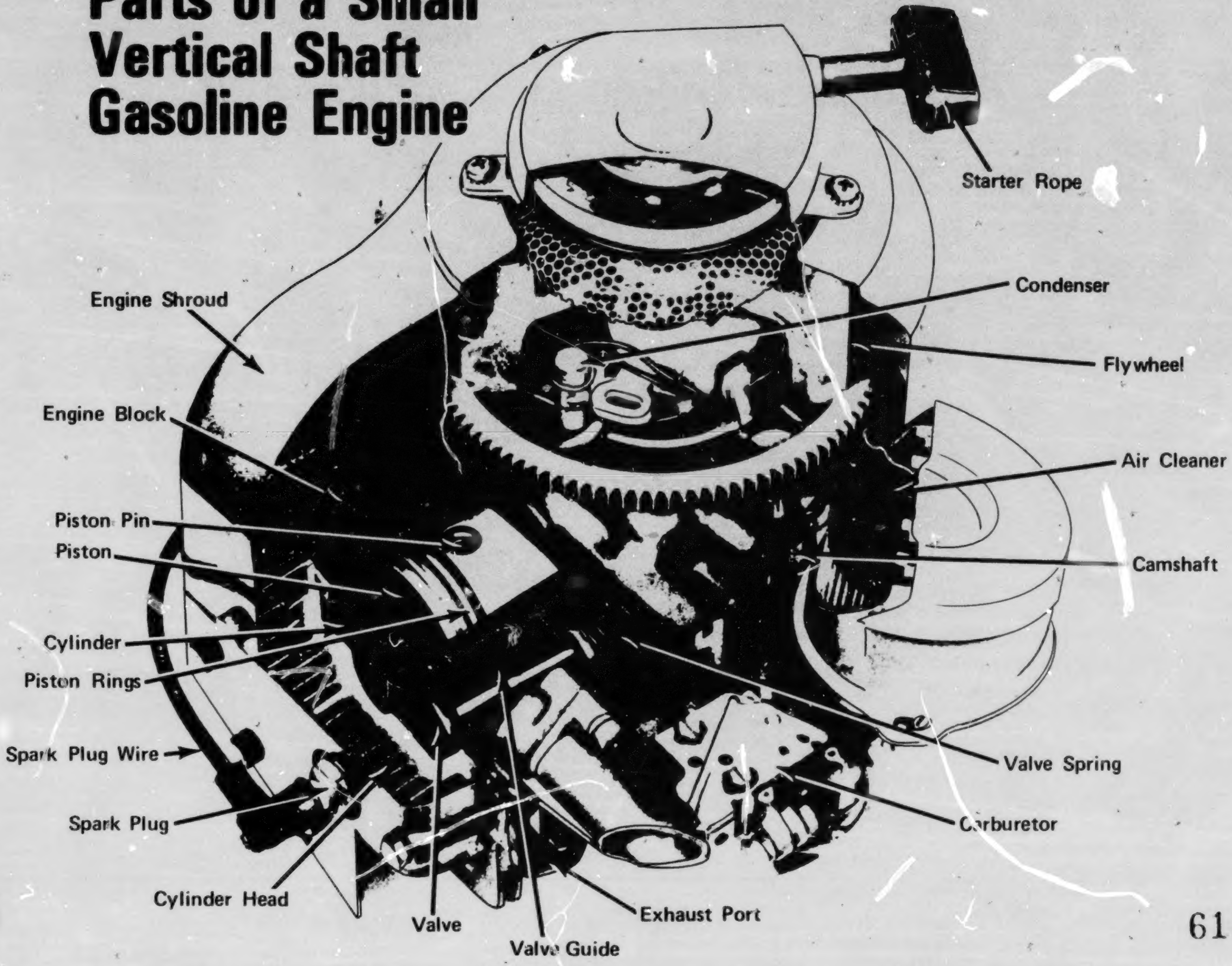
Example:

0.300	Number on the sleeve
0.025	Small graduations on the sleeve
0.015	Graduations on the thimble
0.340	Plain micrometer reading

Parts of a Small Horizontal Shaft Gasoline Engine

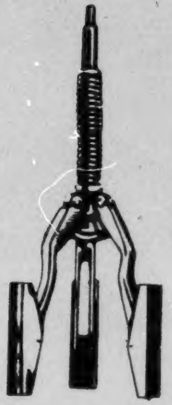


Parts of a Small Vertical Shaft Gasoline Engine



Special Tools

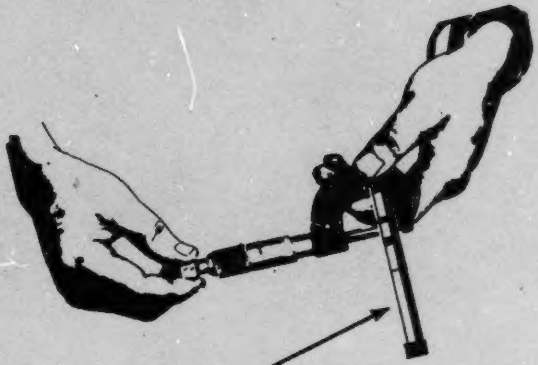
Ridge Reamer



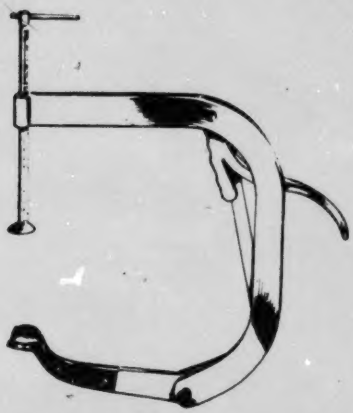
Hone

Valve Guide Reamer

Ring Compressor

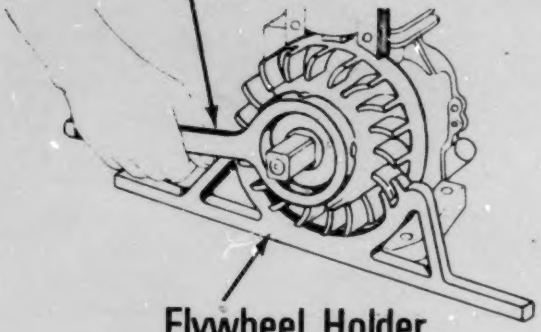


Small Hole Gauge



Valve Spring Compressor

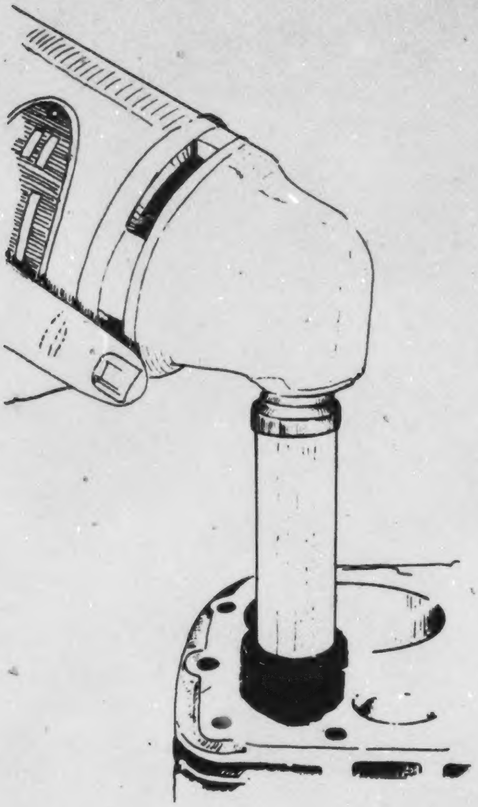
Ring Expander



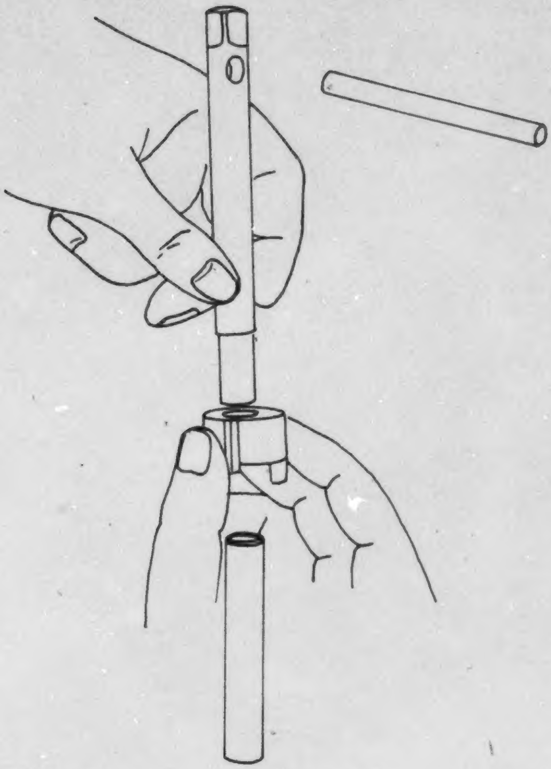
Starter Clutch Wrench

Flywheel Holder

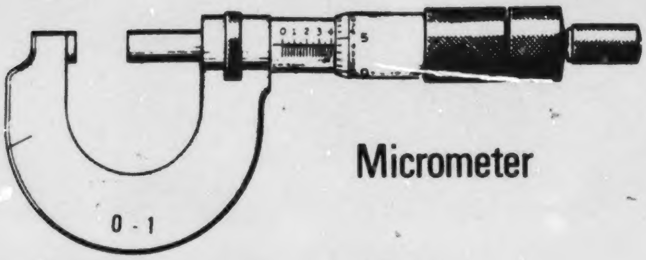
Special Tools
(Continued)



Valve Seat Refacer

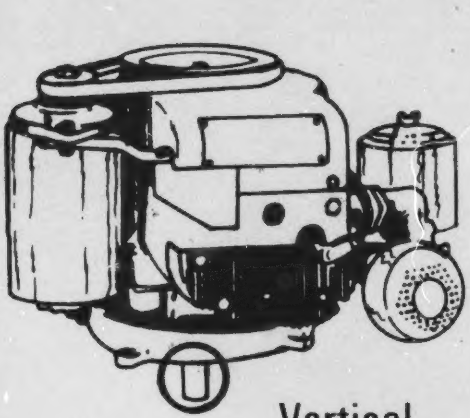


Valve Seat Cutter

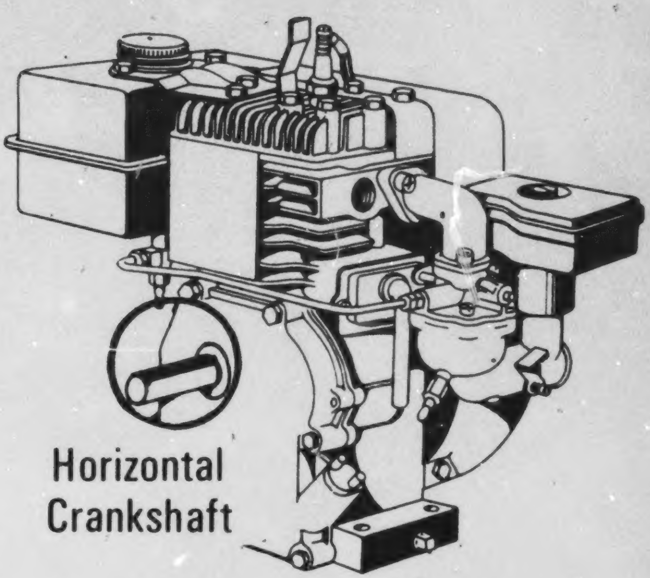


Micrometer

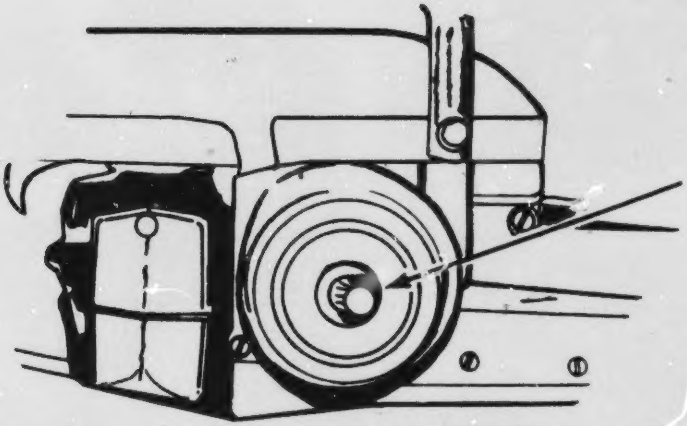
Engine Operating Positions



Vertical Crankshaft

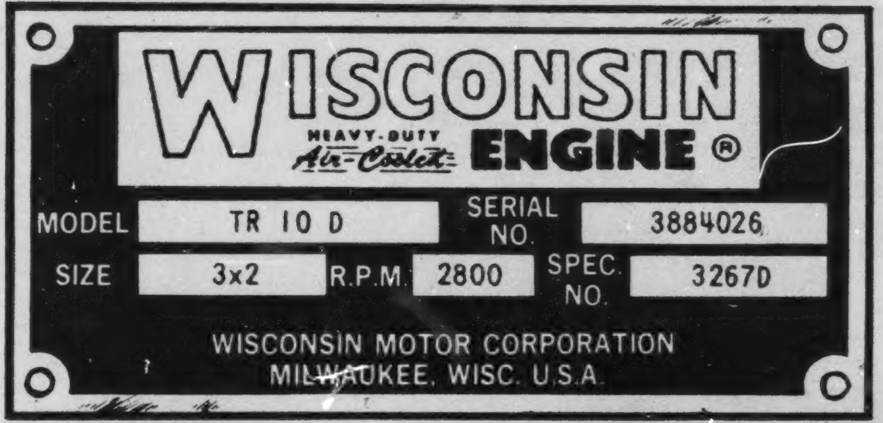


Horizontal Crankshaft



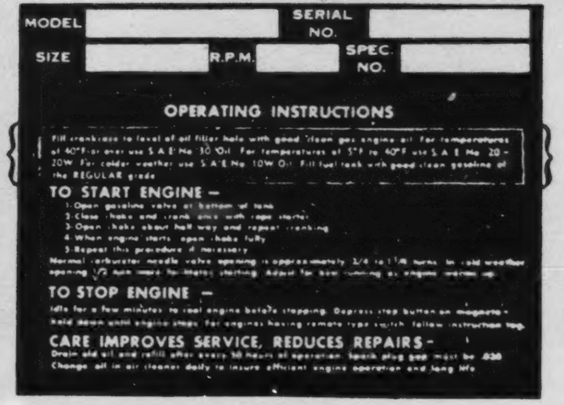
Multiposition Crankshaft

Nameplate Information


WISCONSIN
HEAVY-DUTY
Air-Cooled ENGINE ®

MODEL TR 10 D
SERIAL NO. 3884026
SIZE 3x2
R.P.M. 2800
SPEC. NO. 3267D

WISCONSIN MOTOR CORPORATION
MILWAUKEE, WISC. U.S.A.


MODEL
SERIAL NO.
SIZE
R.P.M.
SPEC. NO.

OPERATING INSTRUCTIONS

Fill crankcase to level of oil filler hole with good clean gas engine oil. For temperatures of 40°F or over use S.A.E. No. 30 Oil. For temperatures of 5°F to 40°F use S.A.E. No. 20-20W. For colder weather use S.A.E. No. 10W Oil. Fill fuel tank with good clean gasoline of the REGULAR grade.

TO START ENGINE –

1-Open gasoline valve at bottom of tank
2-Close choke and crank once with rope starter
3-Open choke about half way and repeat cranking
4-When engine starts, open choke fully
5-Repeat this procedure if necessary

Normal carburetor needle valve opening is approximately 3/4 to 1 1/4 turns. In cold weather opening 1/2 turn more facilitates starting. Adjust for best running as engine warms up.

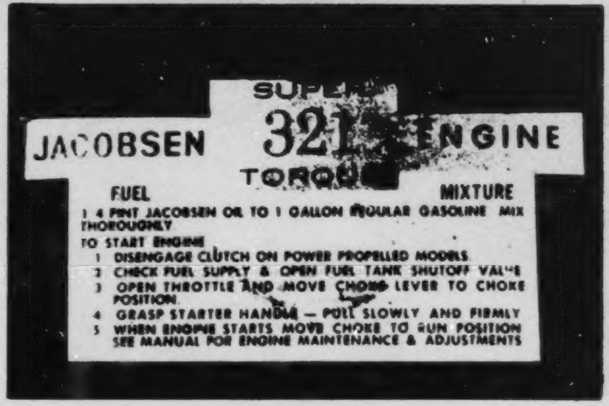
TO STOP ENGINE –

Idle for a few minutes to cool engine before stopping. Depress stop button on magneto - hold down until engine stops. For engines having remote type switch, follow instruction tag.

CARE IMPROVES SERVICE, REDUCES REPAIRS –

Drain old oil and refill after every 50 hours of operation. Spark plug gap must be .030. Change oil in air cleaner daily to insure efficient engine operation and long life.

4-Cycle


SUP[illegible]
JACOBSEN 321 [illegible] ENGINE
TORQ[illegible]

FUEL MIXTURE

1 4 PINT JACOBSEN OIL TO 1 GALLON REGULAR GASOLINE MIX THOROUGHLY

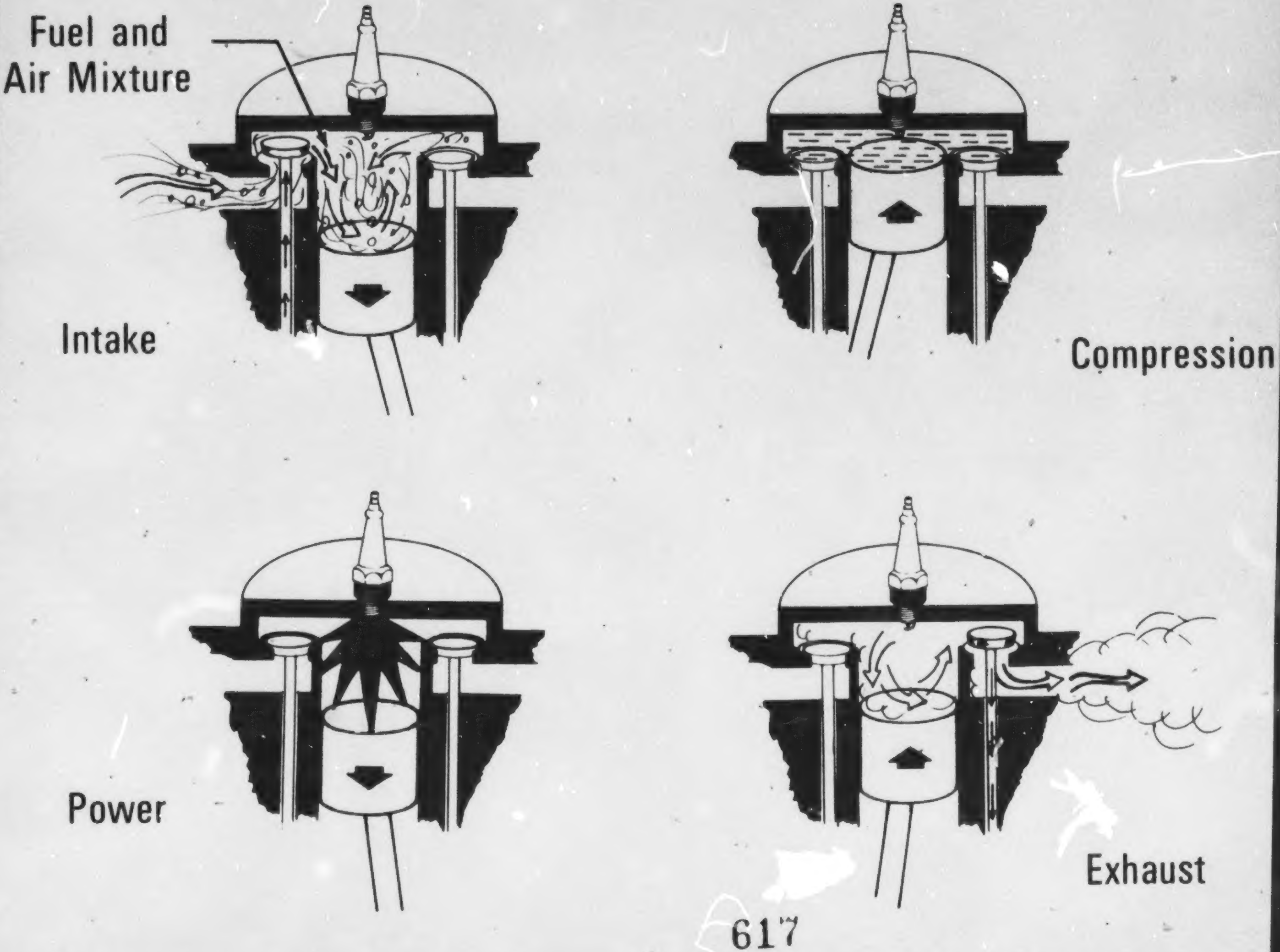
TO START ENGINE

1 DISENGAGE CLUTCH ON POWER PROPELLED MODELS
2 CHECK FUEL SUPPLY & OPEN FUEL TANK SHUTOFF VALVE
3 OPEN THROTTLE AND MOVE CHOKE LEVER TO CHOKE POSITION
4 GRASP STARTER HANDLE — PULL SLOWLY AND FIRMLY
5 WHEN ENGINE STARTS MOVE CHOKE TO RUN POSITION

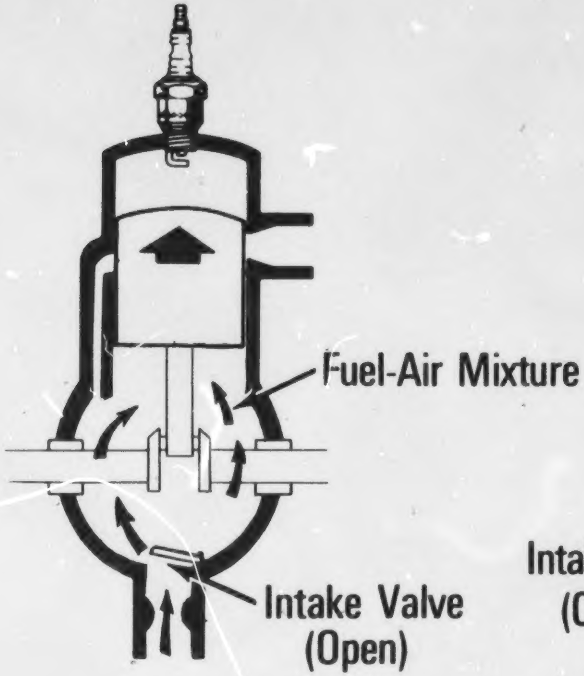
SEE MANUAL FOR ENGINE MAINTENANCE & ADJUSTMENTS

2-Cycle

Strokes of a Four-Stroke Cycle Engine

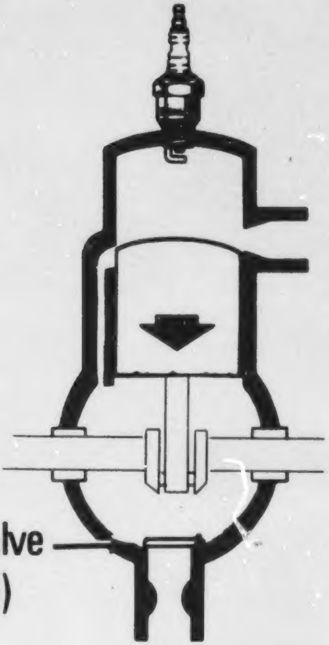


Strokes of a Two-Stroke Cycle Engine



Intake-Compression

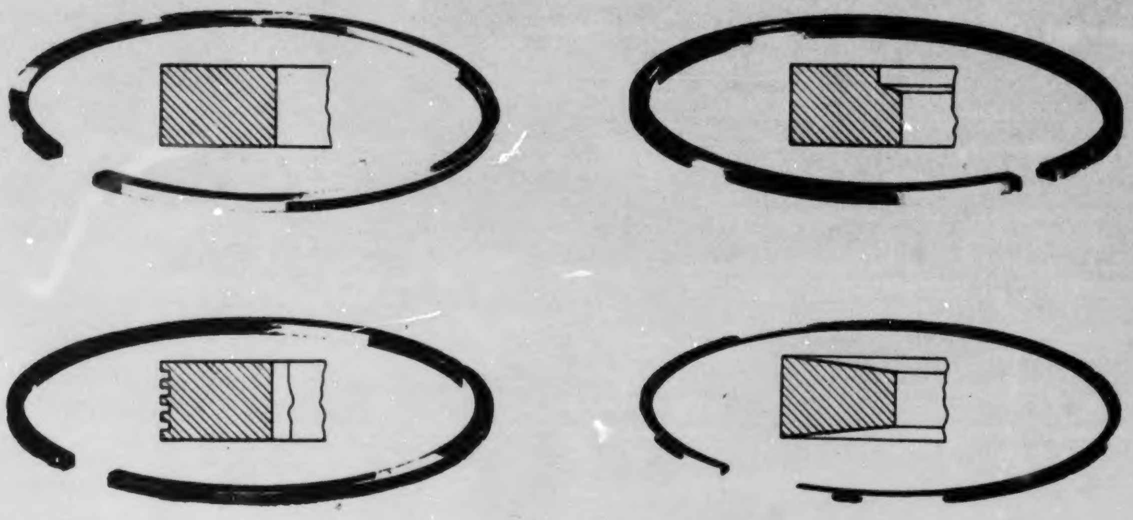
Valve opens to allow
fuel-air-and-oil mixture to
enter the crankcase



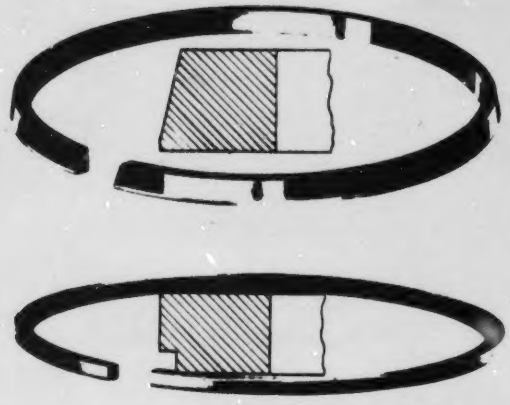
Power-Exhaust

Valve closes on the
downward stroke of the piston
to seal the crankcase

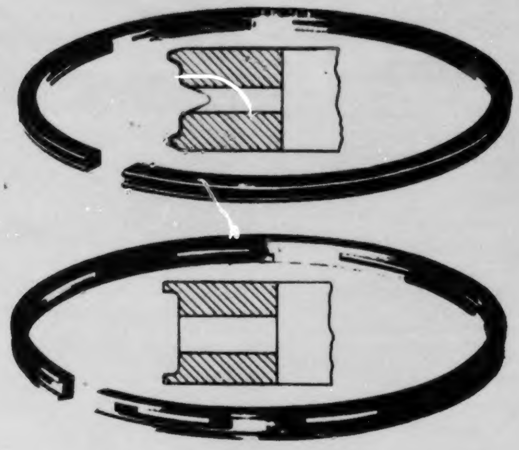
Kinds of Rings



Compression Rings

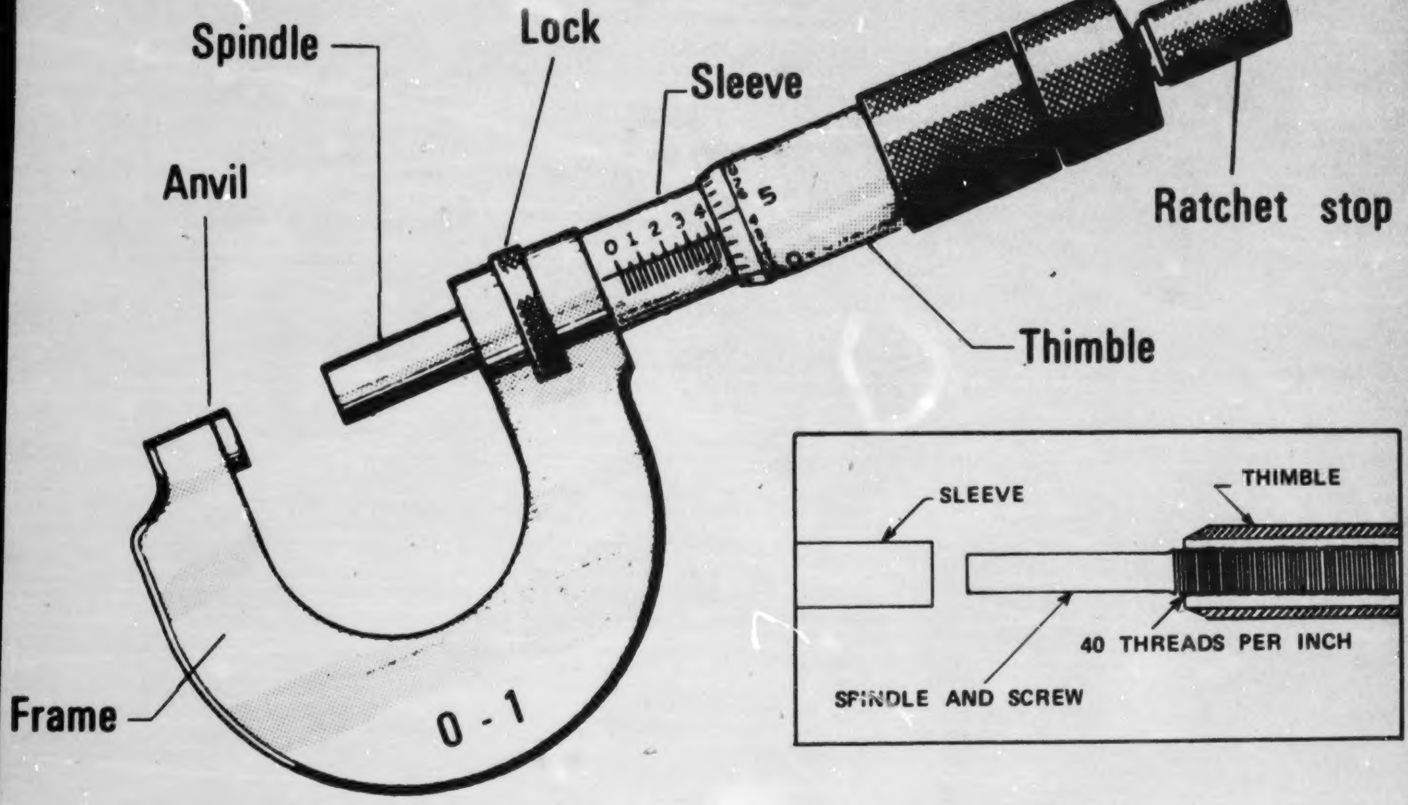


Oil Scraper Rings

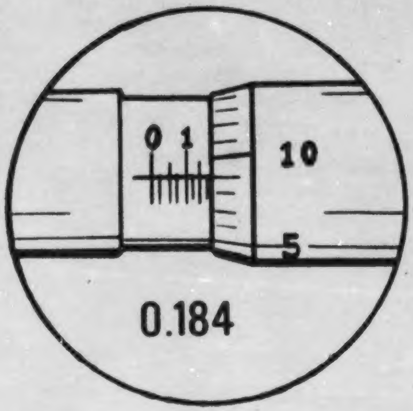


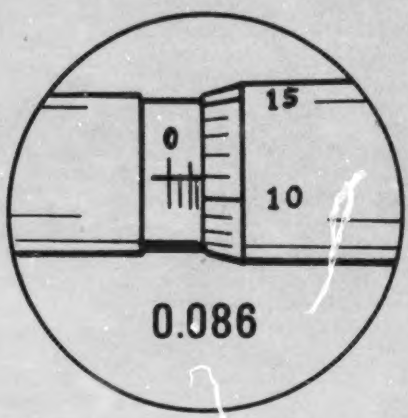
Oil Control Rings

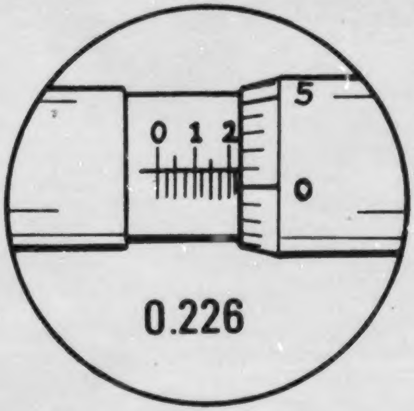
Micrometer Parts

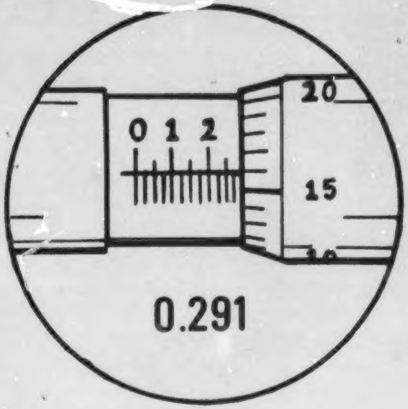


Reading a Micrometer





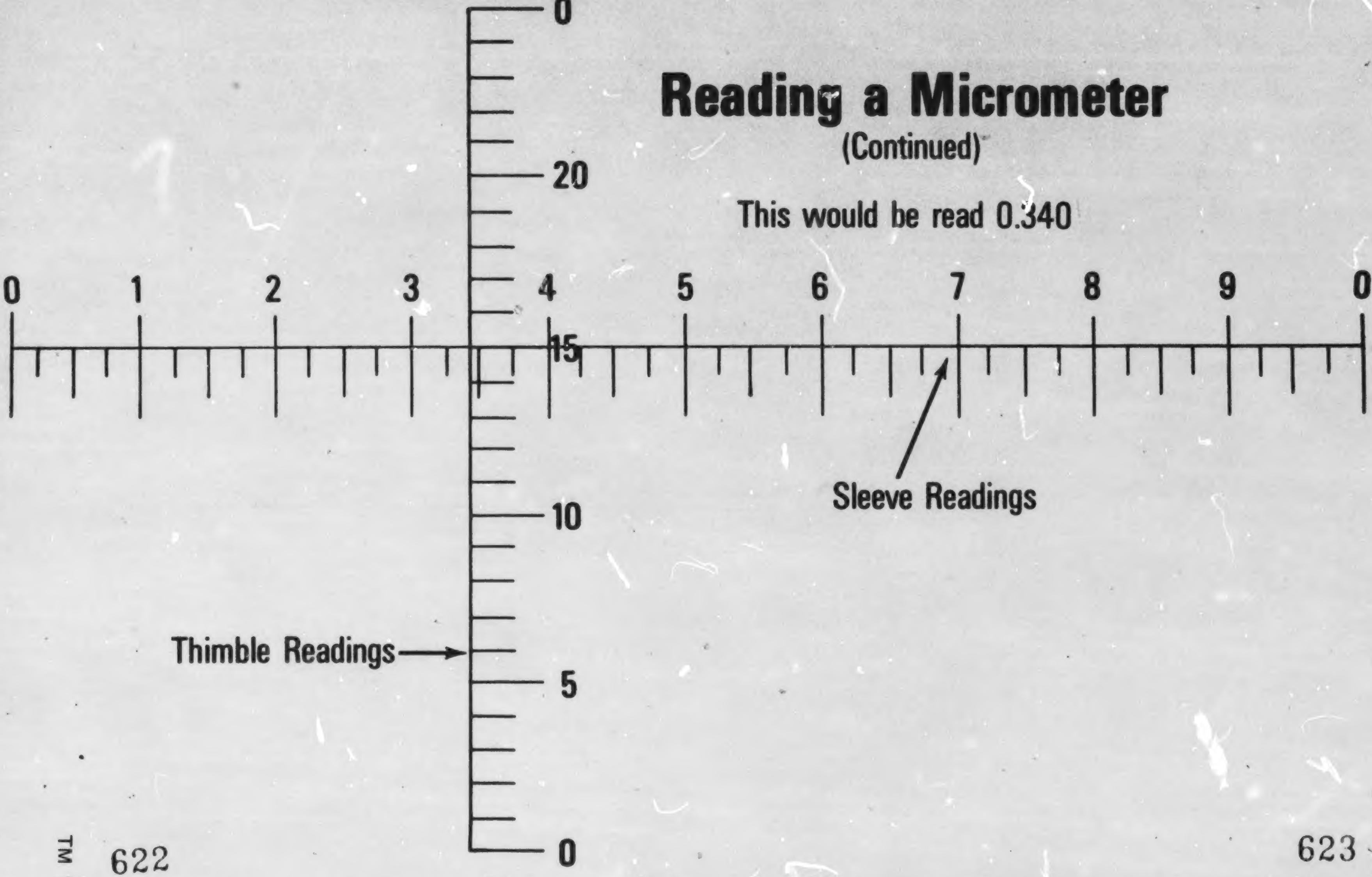




Reading a Micrometer

(Continued)

This would be read 0.340



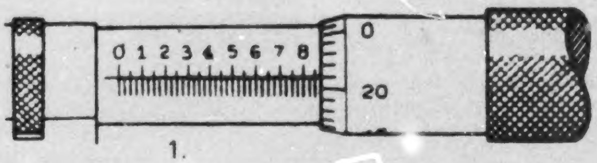
OVERHAULING SMALL GASOLINE ENGINES
UNIT II

ASSIGNMENT SHEET #1--READ THE PLAIN MICROMETER

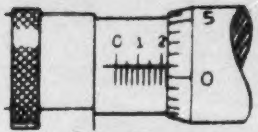
Read the plain micrometer settings below and write the correct answers in the blanks provided.

Answers

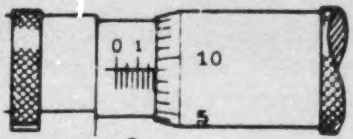
1. ______
2. ______
3. ______
4. ______
5. ______
6. ______
7. ______
8. ______
9. ______
10. ______



1.



2.



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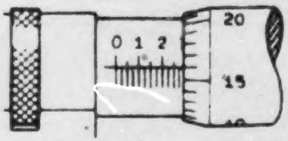

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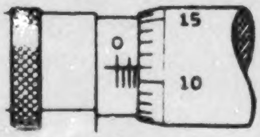
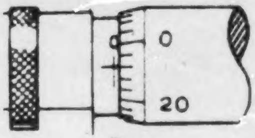
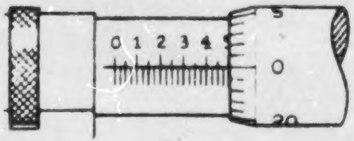


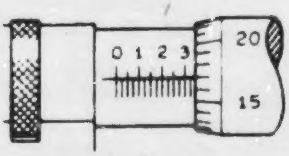
5.



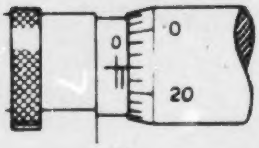
6.



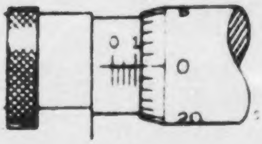
7.



8.



9.



10.

OVERHAULING SMALL GASOLINE ENGINES
UNIT II

ASSIGNMENT SHEET #2--COMPLETE ENGINE INSPECTION CHART

Complete the engine inspection chart of the engine used in either Job Sheet #1 or Job Sheet #2.

Engine: Make ______________ Model ______________

Serial No. ______________________

Specification Number ______________ Horsepower ______________

Operating Position of Crankshaft: Vertical _____, Horizontal _____, Multiposition _____.

Engine Cycle: 2-Cycle _____, 4-Cycle _____.

TYPES OF ACCESSORIES AND MAJOR UNITS:

CARBURETOR AIR CLEANER: Oil-bath ☐, Oiled-filter ☐, Dry-filter ☐.

FUEL STRAINER: Combination screen and sediment bowl ☐, Screen inside the fuel tank ☐.

CRANKCASE BREATHER: Reed valve ☐, Floating disk valve ☐.

STARTER: Rope-wind ☐, Rope-rewind ☐, Wind up ☐, Electric, AC ☐, Electric, DC ☐.

IGNITION SYSTEM: Flywheel magneto ☐, External magneto ☐, Battery ☐.

FUEL PUMP: Mechanically driven ☐, Differential pressure driven ☐.

CARBURETOR: Float ☐, Suction-lift ☐, Diaphragm ☐.

GOVERNOR: Air vane ☐, Centrifugal ☐.

TYPE OF SPARK PLUG: ______________

Gap setting: 0.020" ☐, 0.025" ☐, Other ☐ ______________

OIL RECOMMENDED: ______________________________

IGNITION BREAKER-POINT GAP: 0.012" ☐, 0.015" ☐, Other ☐ __________.

ASSIGNMENT SHEET #2

ITEM		STANDARD	ACTUAL	RECOMMENDATION	Parts No.
CYLINDER	Diameter				
	Out of Round	0			
	Taper	0			
RING GROOVE SIDE CLEARANCE					
RING END GAP	Compression				
	Oil				
CRANKSHAFT	*Magneto Journal				
Diameter	*Crankpin				
	*P.T.O. Journal				
	Magneto Journal	0			
Out of Round	Crankpin	0			
	P.T.O. Journal	0			
MAIN BEARINGS	Magneto Journal	Use go, no go gauge			
	P.T.O. Journal	Use go, no go gauge			
VALVE MARGIN		1/32"			
VALVE GUIDE		Use go, no go gauge			
BREAKER POINT PLUNGER HOLE		Use go, no go gauge			
TAPPET CLEARANCE	Intake				
	Exhaust				
BREAKER POINT GAP					
SPARK PLUG GAP					
ARMATURE AIR GAP					

OVERHAULING SMALL GASOLINE ENGINES
UNIT II

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1

1. 0.871
2. 0.226
3. 0.184
4. 0.291
5. 0.086
6. 0.023
7. 0.500
8. 0.342
9. 0.047
10. 0.125

Assignment Sheet #2

Evaluated to the satisfaction of the instructor

OVERHAULING SMALL GASOLINE ENGINES
UNIT II

JOB SHEET #1--DISASSEMBLE, INSPECT, AND REASSEMBLE A FOUR-STROKE CYCLE ENGINE

I. Tools and materials

  A. Four-stroke cycle engine

  B. Drive socket set, 3/8"

  C. Combination wrench set

  D. Standard screwdriver

  E. Phillips screwdriver

  F. Soft mallet

  G. Adjustable end wrench

  H. Pin punches

  I. Center punches

  J. Flywheel holder

  K. Flywheel puller

  L. Ring compressor

  M. Valve spring compressor

  N. Micrometer

  O. Small hole gauges

  P. Telescoping gauges

  Q. Container for holding small parts

  R. Ridge reamer

  S. Thickness gauge

  T. Torque wrench

  U. File

  V. Emery cloth

JOB SHEET #1

II. Procedure

(NOTE: Engine should be thoroughly cleaned before disassembly.)

A. Disassemble

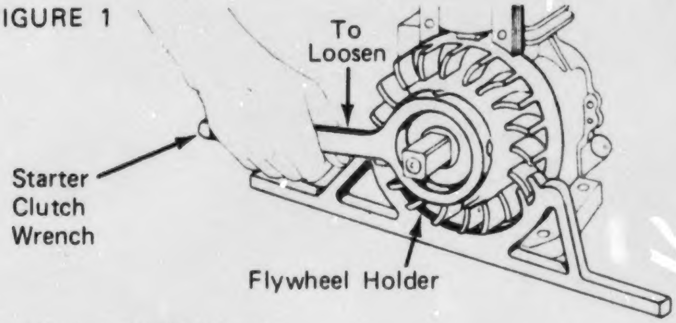
(CAUTION: Never rotate small engines with the spark plug on. Always remove the plug wire before working on the engine.)

1. Drain oil from crankcase
2. Remove gasoline tank

   (NOTE: If carburetor is attached to gasoline tank, make a diagram of the throttle linkage.)
3. Remove carburetor and governor linkage

   (NOTE: Mark governor linkage and spring holes for proper position for reassembly.)
4. Remove muffler assembly
5. Remove engine shroud
6. Set engine on a flywheel holder (Figure 1)

FIGURE 1



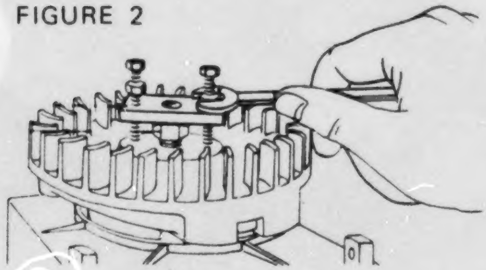
7. Remove the flywheel nut

JOB SHEET #1

8. Remove the flywheel

   a. Use pullers to remove (Figure 2)

FIGURE 2



   b. Check key and keyway

9. Remove magneto assembly, including coil, breaker points, condenser, and laminations

   (NOTE: Lay magneto aside so it will not get moisture or solvent on it.)

10. Remove cylinder head and gasket

11. Remove valve chamber cover and breather assembly

12. Compress the valve springs with a valve spring compressor (Figures 3 and 4)

FIGURE 3

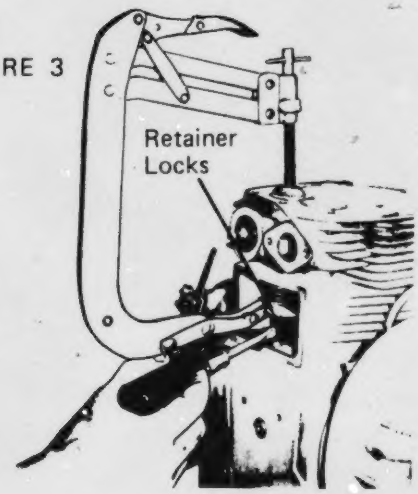
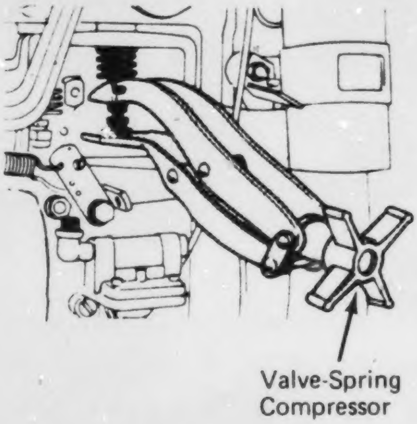


FIGURE 4



JOB SHEET #1

13. Remove valve spring keepers

14. Remove valves and valve springs

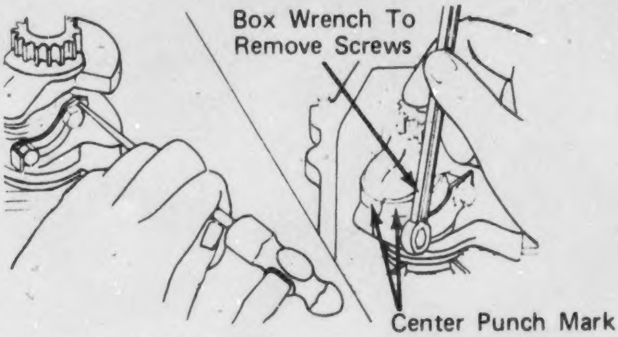
15. Clean dirt and grease from power take-off end of crankshaft

16. Remove any burrs on crankshaft with file or emery cloth

17. Remove base plate or end cover assembly

18. Mark connecting rod and cap with center punch (Figure 5)

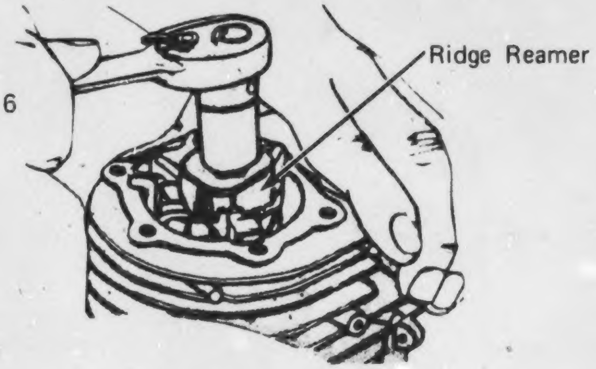
FIGURE 5



19. Remove cap from connecting rod

20. Remove metal ridge with ridge reamer from top of cylinder (Figure 6)

FIGURE 6



21. Remove piston and rod assembly

22. Remove camshaft

23. Remove crankshaft

24. Remove tappets or push rods

JOB SHEET #1

B. Inspect

1. Clean all parts by washing thoroughly with solvent to remove carbon, dirt, or scale
2. Check cylinder bore for score marks
3. Check cylinder cooling fins for breaks
4. Check cylinder in the ring travel area
    a. Measure diameter at top, middle, and bottom of ring travel area
    b. Measure diameter at 90° from first measurements (Figures 7 and 8)

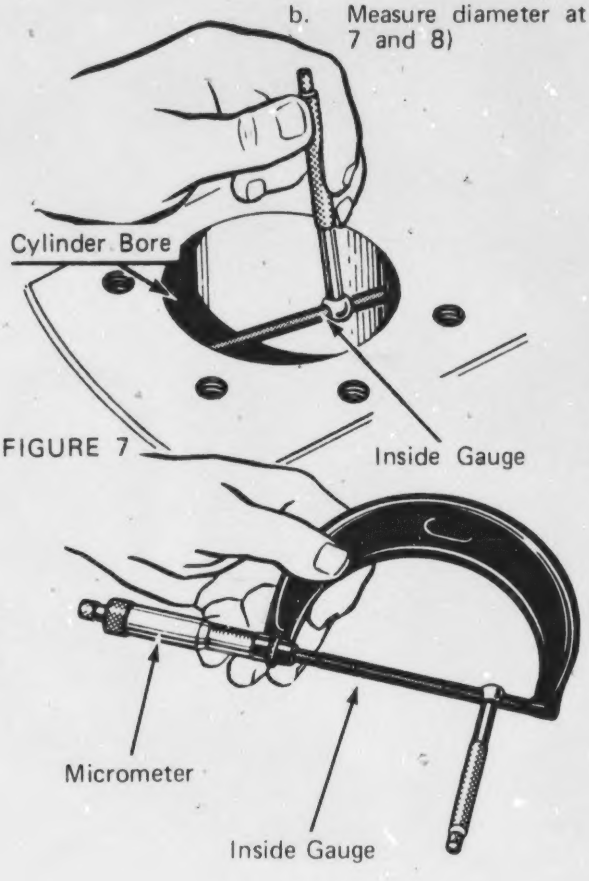
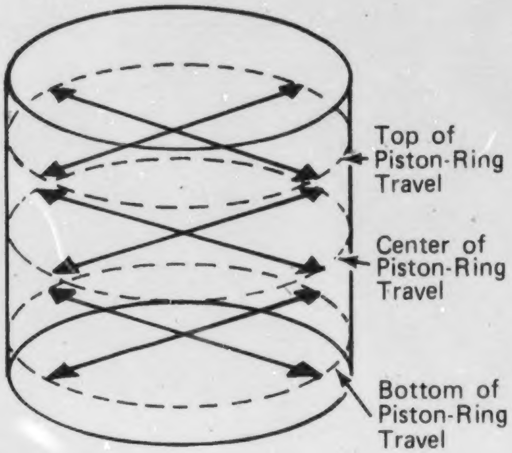


FIGURE 7

FIGURE 8


Top of Piston-Ring Travel
Center of Piston-Ring Travel
Bottom of Piston-Ring Travel

c. Determine wear and out-of-round of cylinder wall

(NOTE: Check manufacturer's specifications for wear tolerance.)

JOB SHEET #1

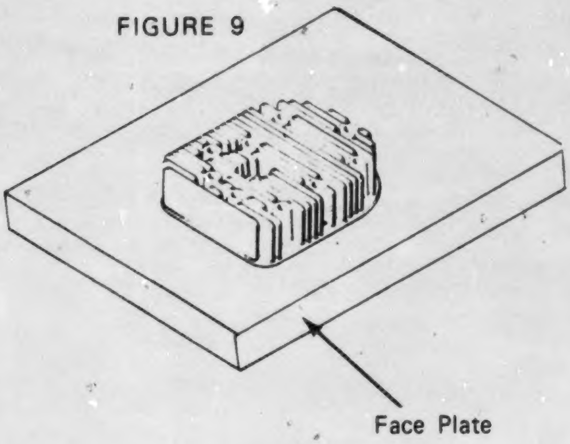
5. Check piston for wear
    - a. Score of piston
    - b. Ring grooves
    - c. Wrist pin and bearing in connecting rod
6. Check crankshaft
    - a. Flatness or out-of-round of crank journal
    - b. Taper of crank
7. Check valves
    - a. Heads of valves
    - b. Valve seats
    - c. Valve guides
8. Inspect all bearings
9. Inspect connecting rod
    - a. Cracks
    - b. Alignment and twist
    - c. Stripped threads
    - d. Wrist pin clearances and condition
    - e. Connecting rod clearances
10. Inspect camshaft
    - a. Lobe wear
    - b. Broken gear teeth
11. Inspect lubrication system
    - a. Pumps
    - b. Scoops
    - c. Splash system
    - d. Connecting rod oil holes

JOB SHEET #1

12. Inspect cylinder head

    a. Check for warpage (Figure 9)

FIGURE 9



    b. Reface head if necessary

13. Inspect all seals

    (NOTE: Measure all parts and refer to service manual for clearances. Replace parts worn beyond tolerance.)

C. Reassemble

1. Replace crankshaft

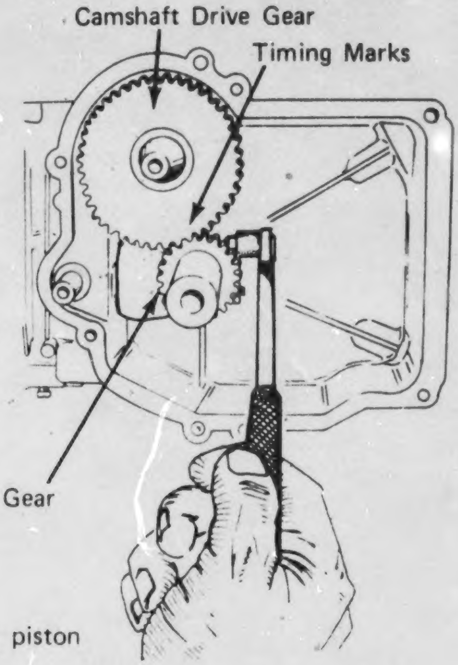
2. Replace tappets and push rods

JOB SHEET #1

3. Replace camshaft

   (NOTE: Make sure timing marks are aligned on camshaft gear and crankshaft gear. See Figure 10.)

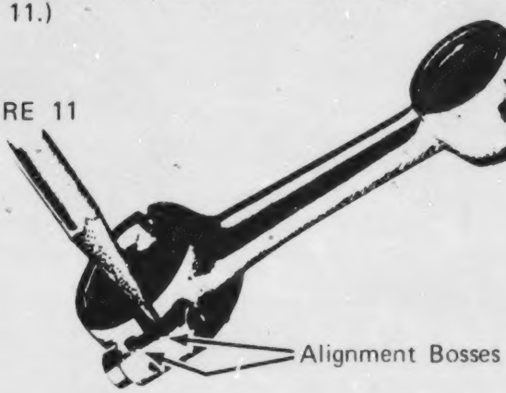
FIGURE 10



4. Install connecting rod on piston
5. Replace piston assembly into block
6. Install connecting rod cap and torque to manufacturer's specifications

   (NOTE: Make sure marks on rod and cap are in alignment. See Figure 11.)

FIGURE 11



7. Place lubrication spinner in place if used

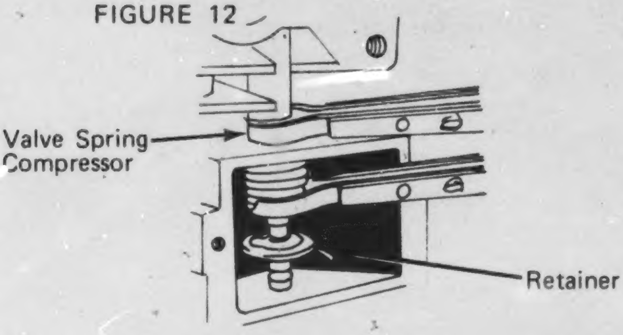
JOB SHEET #1

8. Replace base plate or end cover assembly

9. Replace valves

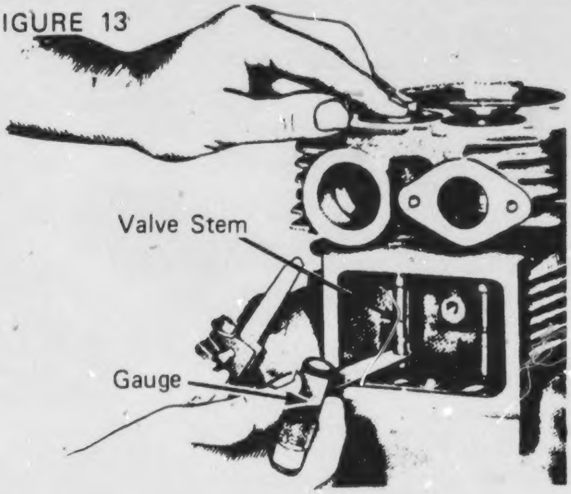
10. Install valve springs and keepers (Figure 12)

FIGURE 12



11. Check valves and tappets for proper clearances (Figure 13)

FIGURE 13



12. Install valve chamber cover and breather assembly

13. Replace cylinder head and gasket and torque to manufacturer's specifications

14. Replace magneto assembly, including coil, breaker points, condenser, and laminations

15. Replace flywheel and flywheel nut

    (NOTE: Check for proper clearances between magneto assembly and flywheel.)

JOB SHEET #1

16. Replace muffler assembly
17. Replace carburetor and governor linkage
18. Replace shrouds
19. Replace gasoline tank if separate from carburetor
20. Replace starting mechanism

    (NOTE: Check to see if engine turns freely.)
21. Fill crankcase with oil

OVERHAULING SMALL GASOLINE ENGINES
UNIT II

JOB SHEET #2--DISASSEMBLE, INSPECT, AND REASSEMBLE A TWO-STROKE CYCLE ENGINE

I. Tools and materials

  A. Two-stroke cycle engine

  B. Drive socket set, 3/8"

  C. Combination wrench set

  D. Standard screwdriver

  E. Phillips screwdriver

  F. Soft mallet

  G. Adjustable end wrench

  H. Pin punches

  I. Center punches

  J. Flywheel holder

  K. Flywheel puller

  L. Ring compressor

  M. Valve spring compressor

  N. Micrometers

  O. Small hole gauges

  P. Telescoping gauges

  Q. Container for holding small parts

  R. Ridge reamer

  S. Thickness gauge

  T. Torque wrench

  U. Emery cloth

  V. File

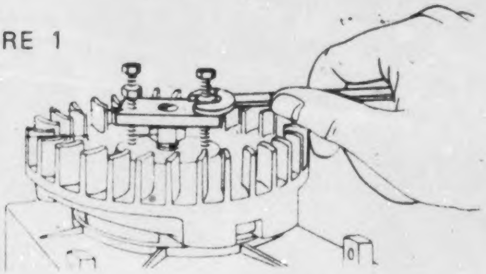
JOB SHEET #2

II. Procedure

A. Disassemble

1. Clean exterior of engine before disassembly
2. Disconnect gas line from carburetor
3. Remove plug wire
4. Remove flywheel nut and washer
5. Lift off starter pulley, plate, screen, pin, and spring from flywheel
6. Remove flywheel by using proper puller (Figure 1)

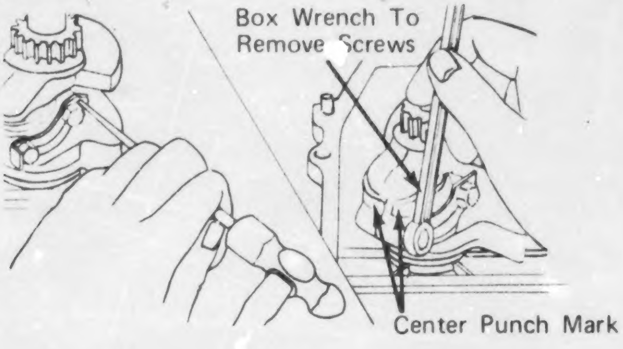
FIGURE 1



7. Lift off governor yolk arm and collar if used on the engine
8. Remove governor spring if used

   (NOTE: Make a diagram of governor linkage before removing.)
9. Remove complete magneto plate
10. Remove carburetor, air filter, and reed valve plate assembly
11. Mark connecting rod cap and rod with center punch (Figure 2)

FIGURE 2

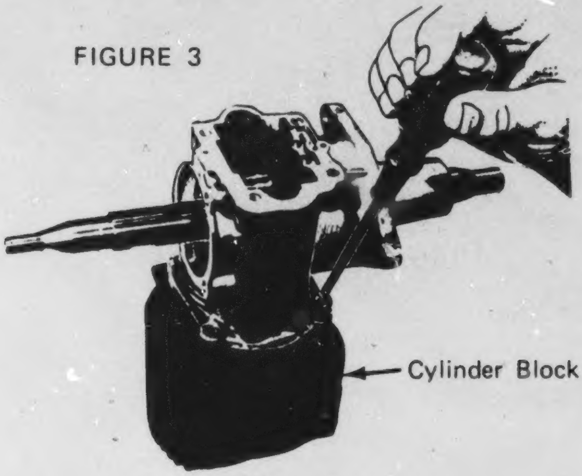


JOB SHEET #2

12. Remove connecting rod cap screws

13. Remove cylinder head, bolts, and gasket (Figure 3)

FIGURE 3



14. Remove piston, rod, and ring assembly from cylinder

15. Remove the crankshaft

B. Inspect

1. Clean all parts of the engine by washing thoroughly with solvent

   (NOTE: Do not get solvent on the magneto.)

2. Check cylinder cooling fins for breaks

JOB SHEET #2

3. Measure cylinder for taper, wear, and out-of-round (Figures 4 and 5)

FIGURE 4

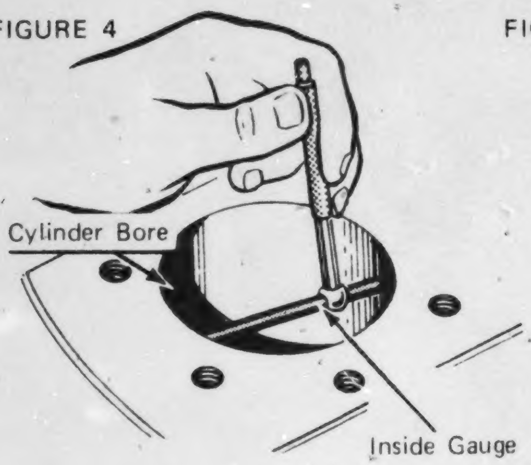
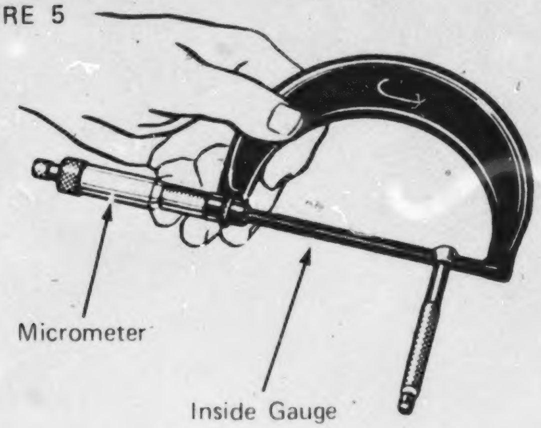


FIGURE 5



4. Check piston clearances using thickness gauge

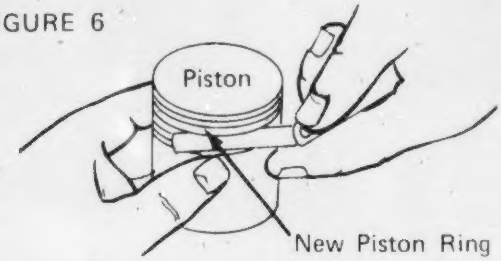
5. Inspect and measure crankshaft bearing journals

   (NOTE: Check for overheating.)

6. Replace all oil seals

7. Inspect and check piston rings (Figure 6)

FIGURE 6



8. Inspect and check connecting rod

   a. Check bearings

   b. Check for cracks

   c. Check rod clearances

9. Check cylinder for score marks

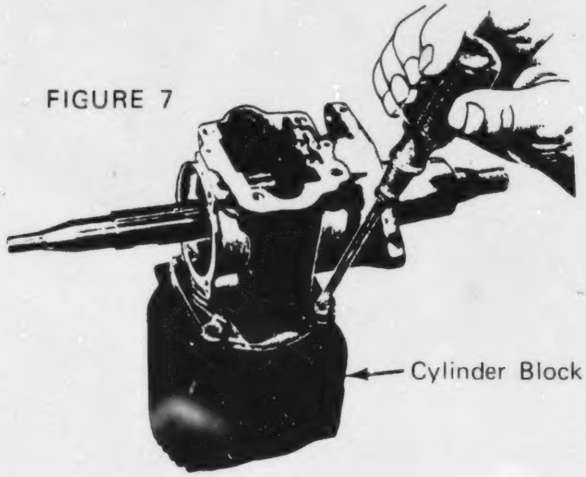
JOB SHEET #2

10. Inspect magneto
    a. Check for loose mounting screws
    b. Check contact point air gap
    c. Check condition of points
    d. Check rubbing block (fiber block) for wear and lubrication
    e. Check for wear between crankshaft and magneto plate bearing
    f. Test coil and condenser
    g. Adjust ignition points to properly specified gap
    h. Check primary and secondary wire for insulation breaks

    (NOTE: During inspection of the engine parts, service manual tolerance should be observed when taking measurements. Replace all worn parts.)

C. Reassemble
   1. Replace crankshaft
   2. Install piston, rod, and ring assembly in cylinder
   3. Replace cylinder head, bolts, and gasket (Figure 7)

FIGURE 7

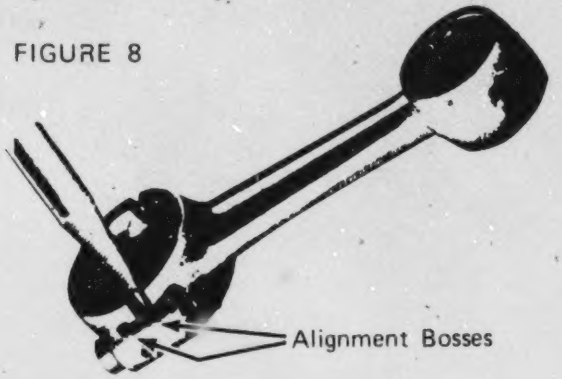


JOB SHEET #2

4. Connect rod to crankshaft

   (NOTE: Make sure marks on the cap and rod are in proper alignment. See Figure 8.)

FIGURE 8



5. Replace carburetor, air filter, and reed plate assembly
6. Replace magneto plate
7. Replace governor spring if used
8. Replace governor yolk arm and collar if used
9. Install flywheel on crankshaft
10. Replace starter pulleys, plate, screen, pin, and spring on flywheel
11. Install flywheel nut and washer
12. Replace plug wire
13. Connect gas line to carburetor

(NOTE: In overhauling two-stroke cycle engines, follow manufacturer's recommendations on all clearances and tolerances.)

OVERHAULING SMALL GASOLINE ENGINES
UNIT II

JOB SHEET #3--REFACE VALVES AND VALVE SEATS

I. Tools and materials

  A. Exhaust and intake valves

  B. Valve grinding machine

  C. Safety goggles

  D. Small engine block

  E. Valve seat grinding machine

II. Procedure

  A. Reface valves

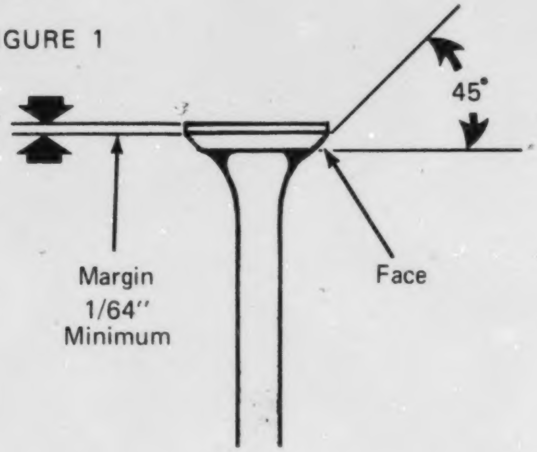
    1. Check valve for worn areas, cracks in head, or damaged areas

    2. Dress the valve grinding wheel if needed

    3. Adjust the valve grinder for grinding the proper face angle

    (NOTE: Check manufacturer's recommendations for proper angle. See Figure 1.)

FIGURE 1



JOB SHEET #3

4. Place valve in grinder chuck and tighten it securely (Figures 2 and 3)

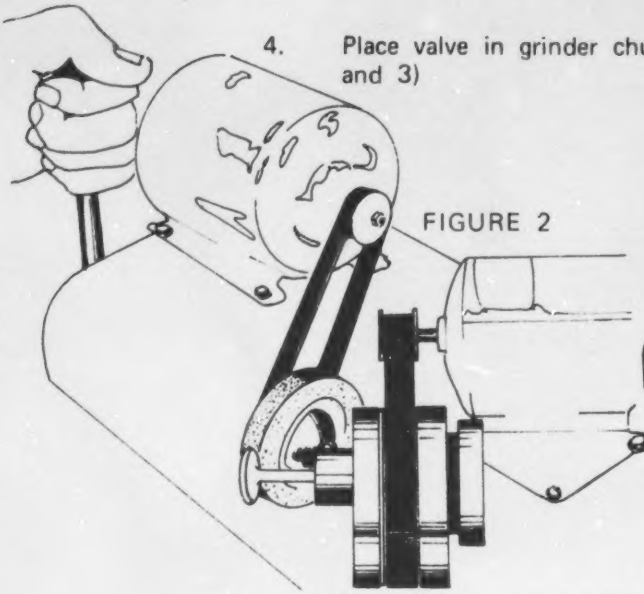
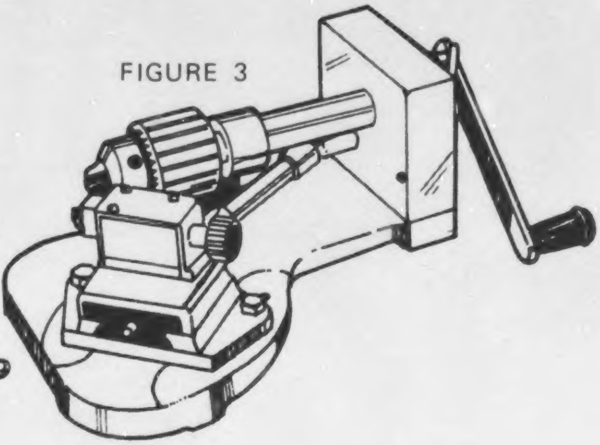


FIGURE 2

FIGURE 3



5. Check to see that the valve face is in proper position to contact the grinding wheel

   (NOTE: Make sure the valve head is straight and does not wobble due to a bent valve stem.)

6. Move valve in and out before starting grinder

7. Set the machine so the wheel will not contact the valve stem

8. Start grinder

9. Make sure cutting oil is flowing

10. Move the valve face up to the wheel and start grinding tightly

11. Take light cuts and continue until the grinding sound is regular

    (NOTE: Do not try to finish the grinding without checking the progress often.)

12. Remove the valve from the grinding machine

13. Check the valve face width

    (NOTE: You may not be able to grind the valve face adequately before grinding the margin too thin. If the margin is less than 1/64" or less than half the thickness of the new valve margin, discard the valve.)

14. Stop the grinder

JOB SHEET #3

15. Clean valve with petroleum solvent

B. Reface valve seats (electric power grinder)

1. Select a grinding wheel with the proper angle

   (NOTE: Check manufacturer's recommendations for proper angle.)

2. Be sure wheel is dressed properly

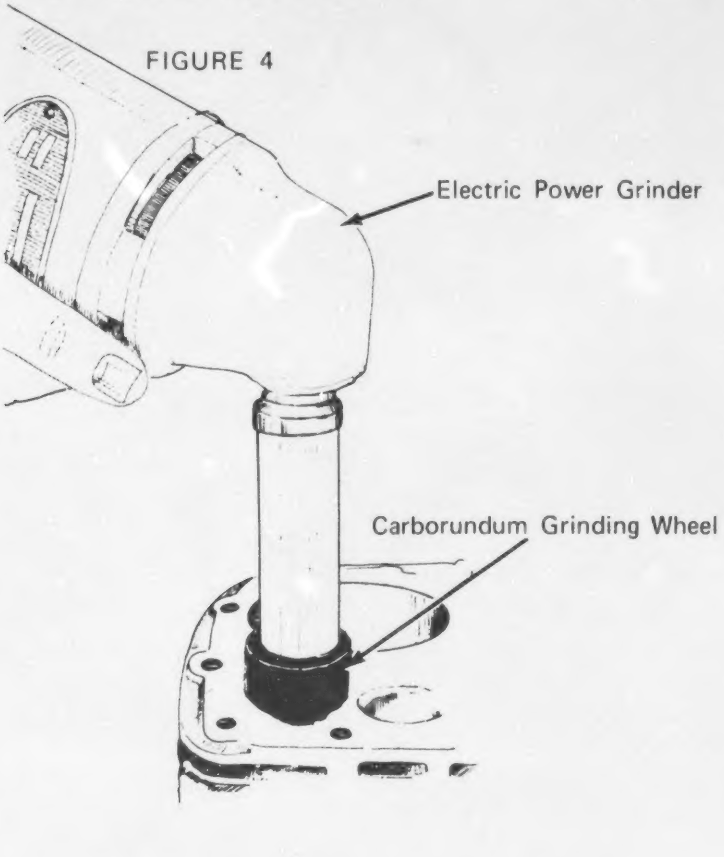
3. Install the pilot in the valve guide

   (NOTE: It is very important that the valve guides be checked and replaced, if necessary, before grinding the valve seats.)

4. Slip the grinding wheel over the pilot

5. Grind the valve seat (Figure 4)

FIGURE 4

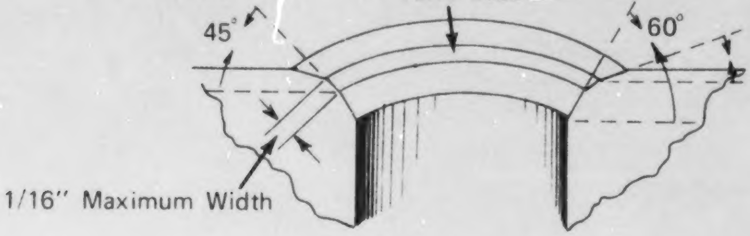


JOB SHEET #3

6. Check the width of valve seat (Figure 5)

   (NOTE: Width of face of valve seat should not be more than 1/16" wide or the valve will not seat properly.)

FIGURE 5



7. Smooth burred edge with the original seat-grinding wheel

8. Check the valve in the seat

   (NOTE: Use of prussian blue will indicate if valve face and seat are matched. Sometimes a shift imperfection can be corrected by "lapping" the valve and seat with a lapping compound.)

9. Lap the valve to the seat if necessary (Figure 6)

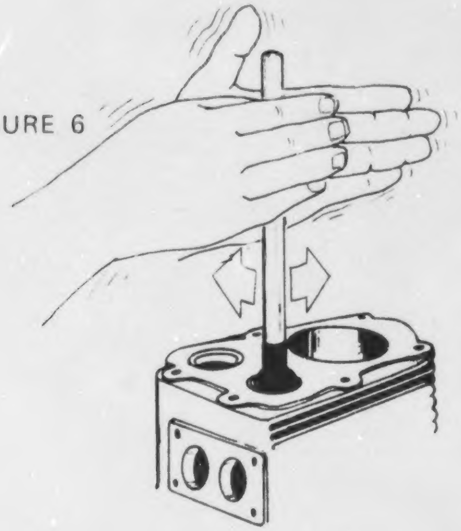


FIGURE 6

OVERHAULING SMALL GASOLINE ENGINES
UNIT II

JOB SHEET #4--REPLACE RINGS

I. Tools and materials

  A. Piston

  B. Ring expander

  C. Special scraper tool

  D. Micrometer

  E. Piston-ring groove gauge

  F. Thickness gauge

  G. Set of rings

  H. Solvent

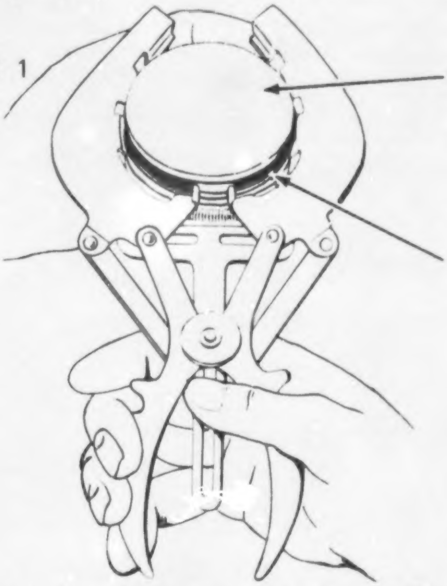
  I. Shop towels

II. Procedure

  A. Clean and inspect piston and rings

    1. Remove old rings from piston with ring expander (Figure 1)

FIGURE 1



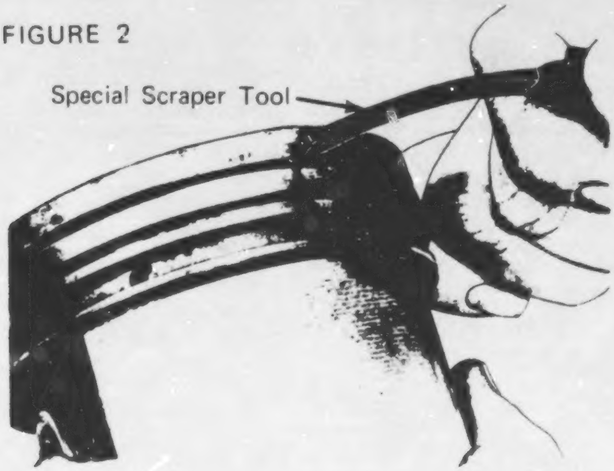
    2. Soak the piston and rings in a special carbon solvent

JOB SHEET #4

3. Scrape the carbon from the ring groove with the special scraping tool (Figure 2)

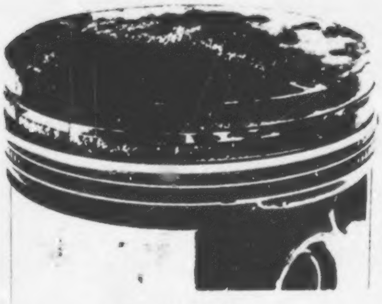
   (NOTE: Be careful not to scratch the piston.)

FIGURE 2



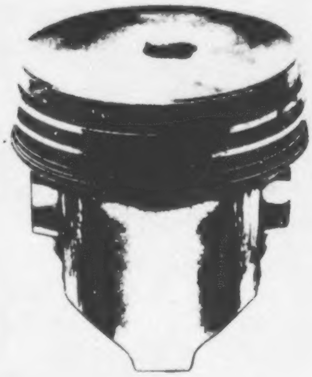
4. Check the condition of the piston and rings (Figures 3, 4, and 5)

FIGURE 3



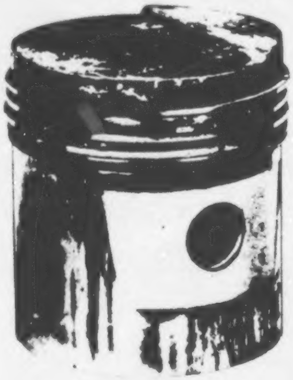
Detonation

FIGURE 4



Preignition

FIGURE 5



Scuffing

   a. Check for burning, top groove wear, and broken or stuck rings

   b. Check for scuffing and scoring

   c. Check for scratches on the piston and the ring

JOB SHEET #4

5. Measure the piston for wear (Figures 6 and 7)

   (NOTE: Check manufacturer's recommendations for critical clearances on wear.)

FIGURE 6

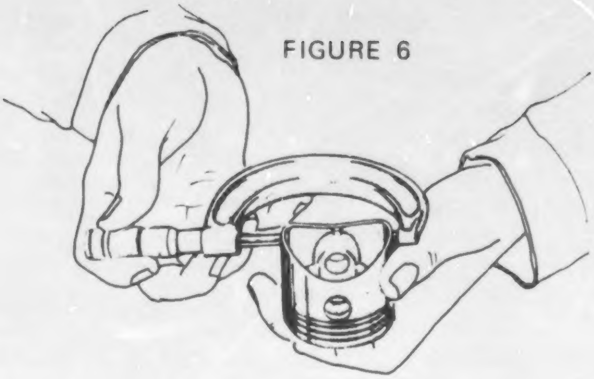
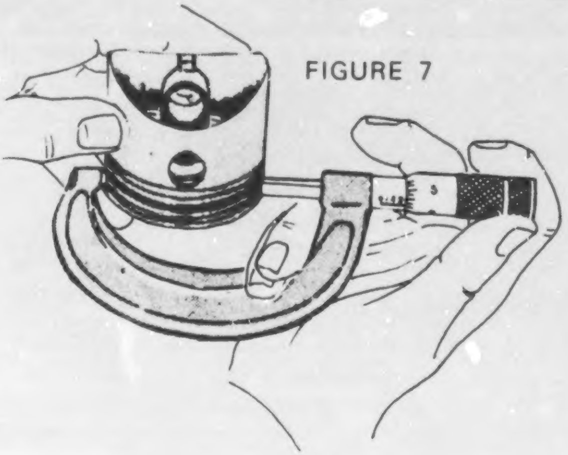


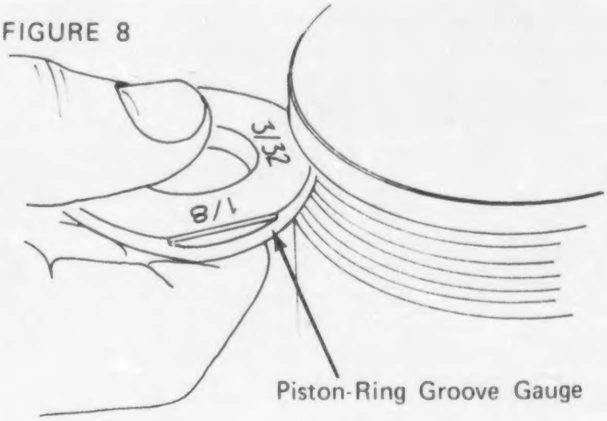
FIGURE 7



6. Check the ring groove wear with ring groove gauge (Figure 8)

   (NOTE: Check manufacturer's specifications on ring groove wear.)

FIGURE 8



7. Check rings for wear (Figures 9 and 10)
   a. Insert the rings one at a time into cylinder
   b. Push rings in with a piston with rings removed

JOB SHEET #4

c. Measure the ring gap with thickness gauge

(NOTE: Check manufacturer's specifications for tolerance.)

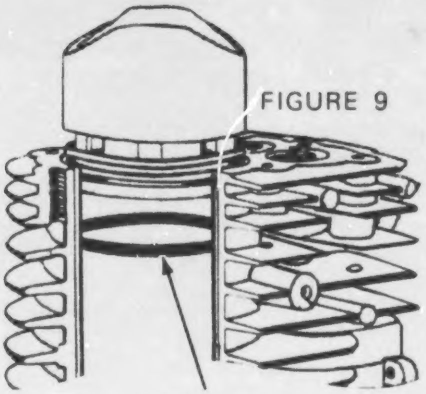
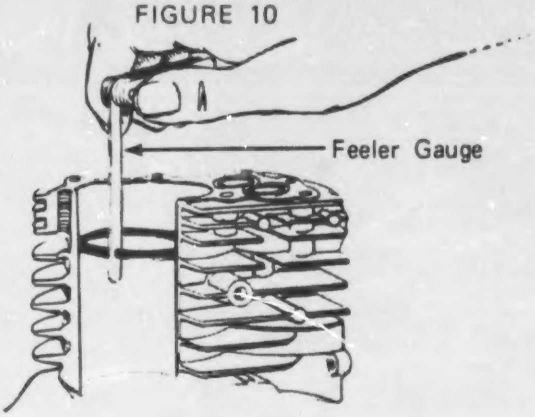


FIGURE 9

FIGURE 10



B. Check end gap if new rings are to be installed (Figures 9 and 10)

1. If the end gap is too small, file the end to proper gap

2. If the end gap is too large, then the ring size is wrong or the cylinder is worn too much and must be rebored and an oversized piston and rings installed

C. Apply crankcase oil to the rings and piston

D. Install the rings on the piston using the ring expander (Figure 11)

(CAUTION: Be careful not to break ring.)

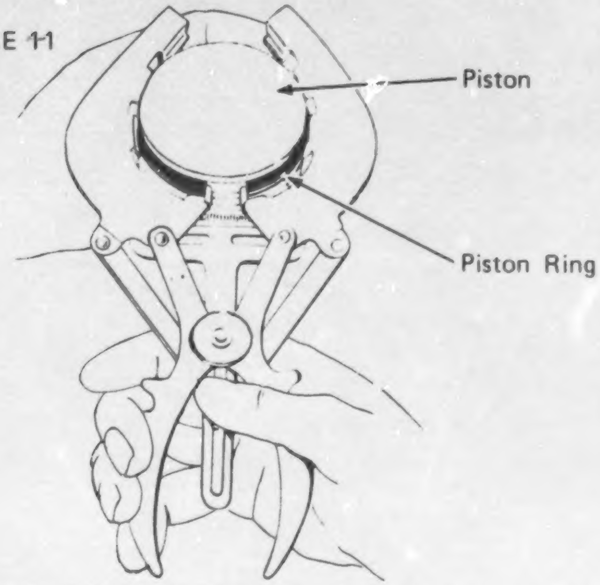
1. Begin with bottom ring

2. Install ring expanders first if they are used

(CAUTION: Be sure to install the ring right side up. Some rings are marked TOP; others are not marked. Check service or operation manual.)

JOB SHEET #4

FIGURE 11



E. Check the rings for freedom of movement in the grooves

F. Stagger the ring gap (Figures 12 and 13)

(NOTE: Ring gaps should be staggered to insure proper compression in the cylinder.)

FIGURE 12

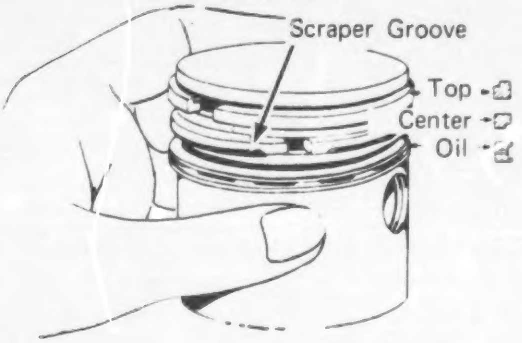
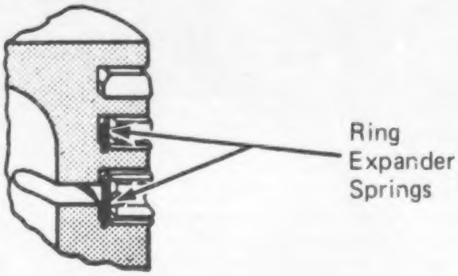


FIGURE 13



G. Replace piston and rod assembly in cylinder using the ring compressor

OVERHAULING SMALL GASOLINE ENGINES
UNIT II

TEST

NAME ______________________________ SCORE ____________________

1. Match terms on the right to the correct definitions by placing the appropriate numbers in the blanks provided.

_____a. Device inserted into the combustion chamber of an engine to produce the spark to ignite the compressed fuel-air mixture

_____b. Largest single piece of an engine; basis or main mass of metal in which the cylinders are bored or placed

_____c. Cylindrical part closed at one end which is connected to the crankshaft by the connecting rod

_____d. Material along or through which electricity will flow with slight resistance

_____e. Area of the cylinder above the piston with the piston at top dead center

_____f. Scratch, ridge, or groove marring a finished surface

_____g. Device for temporarily collecting and storing an overflow of electrical current for later discharge

_____h. Valve which permits fuel-air mixture to enter the combustion chamber or cylinder and then seals the exit

_____i. Expanding ring placed in the grooves of the piston to provide a seal to prevent the passage of fuel-air mixture past the piston

_____j. Hole in engine block which receives a piston; sometimes referred to as *bore* or *barrel*

_____k. Reduction in volume of fuel-air mixture within the cylinder

1. Intake valve
2. Piston
3. Spark plug
4. Combustion chamber
5. Compression
6. Condenser
7. Conductor
8. Cylinder block
9. Piston ring
10. Score
11. Cylinder

______ l. Device which permits the spent fuel-air mixture to leave the combustion chamber

______ m. Burning process

______ n. Pipe connecting the engine to the muffler to conduct the exhaust gases away from the engine

______ o. Rod that connects the piston to the crankshaft

______ p. Detachable portion of an engine fastened securely to the cylinder block which contains all or a portion of the combustion chamber

______ q. Shaft containing lobes or cams to operate the engine's valves

______ r. Pin that goes through the small end of the connecting rod which also passes through the piston walls; also known as *wrist pin*

______ s. Means for igniting the fuel in the combustion chamber; includes spark plugs, wires, ignition coil, points, condenser, and source of electrical current

______ t. Device for automatically mixing fuel in the proper proportions with air to produce a combustible gas

______ u. Main shaft of the engine which, in conjunction with the connecting rods, changes the reciprocating motion of the pistons into rotary motion

______ v. Space between the electrodes of a spark plug through which the spark jumps

______ w. Control device used to regulate engine speed

______ x. Part of the piston above the rings

______ y. Housing in which the crankshaft and many other parts of the engine operate

12. Spark
13. Spark gap
14. Combustion
15. Stroke
16. Exhaust valve
17. Connecting rod
18. Cylinder head
19. Exhaust pipe
20. Gasket
21. Governor
22. Ignition system
23. Camshaft
24. Carburetor
25. Piston head
26. Piston pin
27. Crankcase
28. Crankshaft

(NOTE: Definitions are continued on the next page.)

_____z. Distance piston travels inside the cylinder

____aa. Anything used as a packing, such as nonmetallic substance, placed between two metal surfaces to act as a seal

____bb. Electrical current possessing sufficient pressure to jump through the air from one conductor to another

2. Identify parts of the small horizontal shaft gasoline engine below by writing the correct names in the blanks provided.

a. ____________________

b. ____________________

c. ____________________

d. ____________________

e. ____________________

f. ____________________

g. ____________________

h. ____________________

i. ____________________

j. ____________________

k. ____________________

l. ____________________

m. ____________________

n. ____________________

o. ____________________

p. ____________________

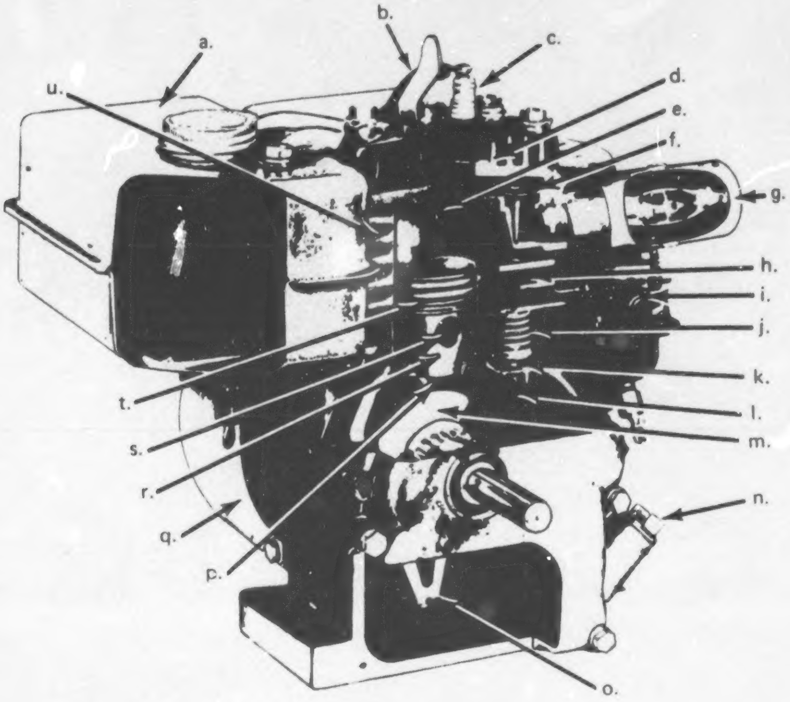
q. ____________________

r. ____________________

s. ____________________

t. ____________________

u. ____________________



3. Identify the following special tools needed in overhauling small engines. Write the correct names in the blanks provided.

a. ____________________

b. ____________________

c. ____________________

d. ____________________

e. ____________________

f. ____________________

g. ____________________

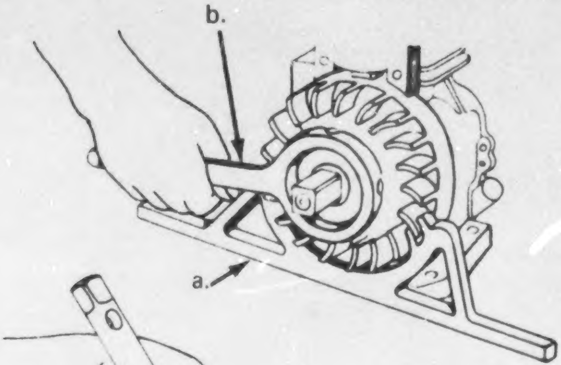
h. ____________________

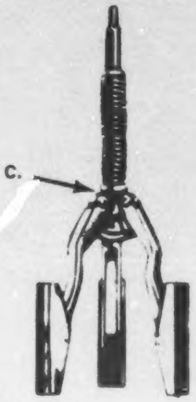
i. ____________________

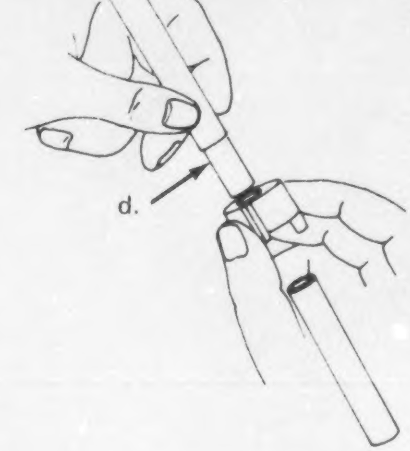
j. ____________________

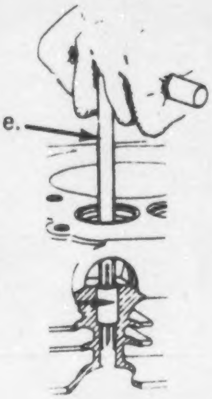
k. ____________________

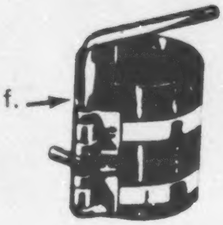
l. ____________________

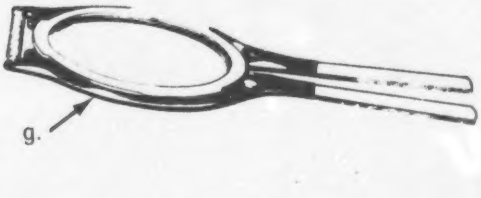


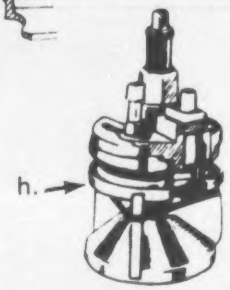


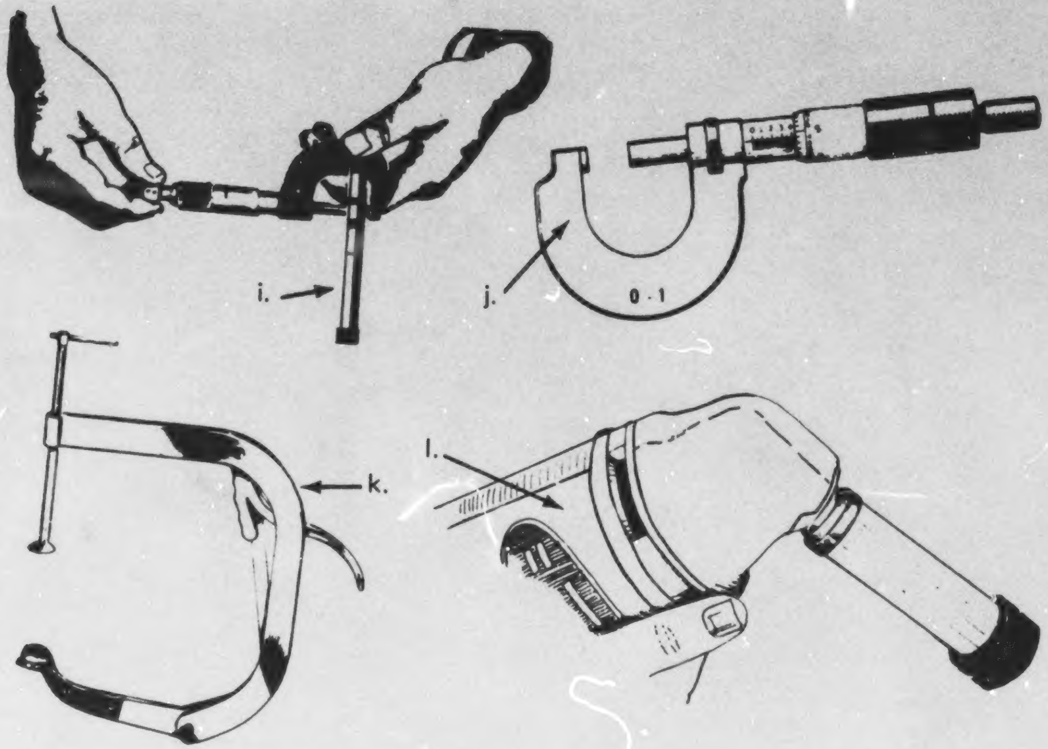




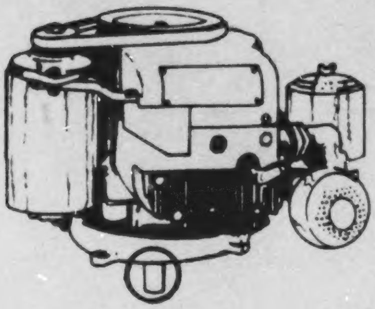




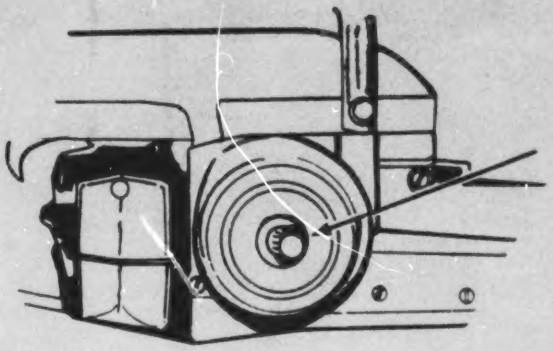



i.
j.
0 - 1
k.
l.

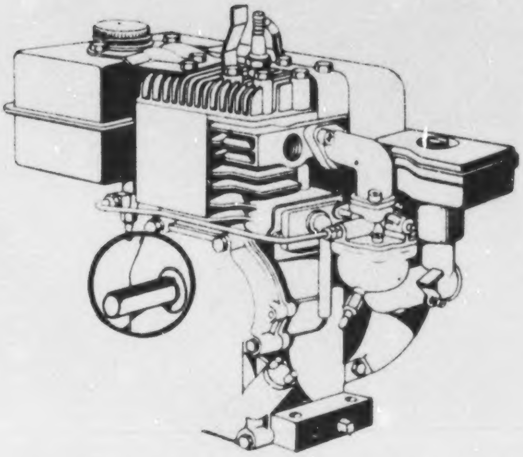
4. Identify the basic operating positions of small gasoline engines by writing the positions in the blanks provided.



a. ____________________



b. ____________________



c. ____________________

5. List five items found on an engine nameplate.

a. ____________________

b. ____________________

c. ____________________

d. ____________________

e. ____________________

6. State the importance of being able to read an engine nameplate.

____

____

____

7. Describe the differences between two-stroke and four-stroke cycle engines.

____

____

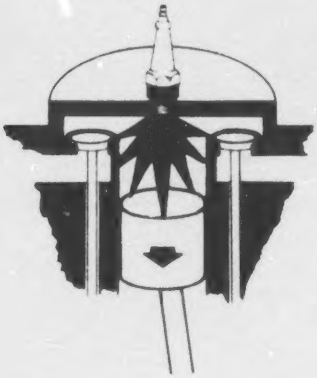
____

____

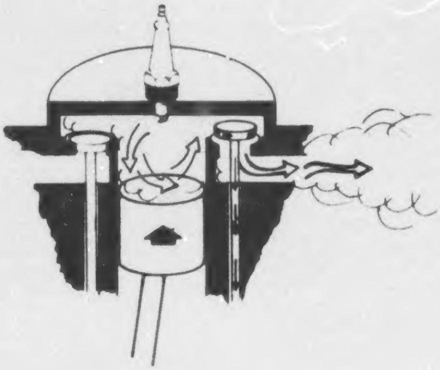
____

8. Identify the strokes of a four-stroke cycle engine and a two-stroke cycle engine by writing the correct names in the blanks provided.

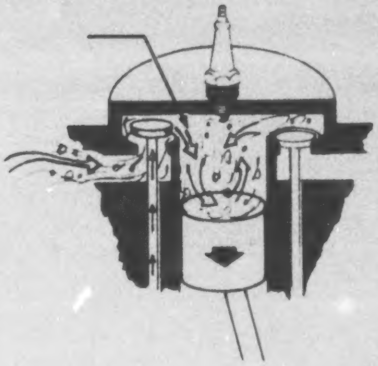
a. Four-stroke cycle engine

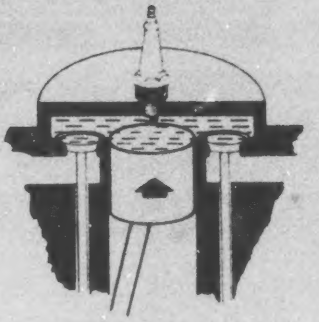


1) ____________________



2) ____________________

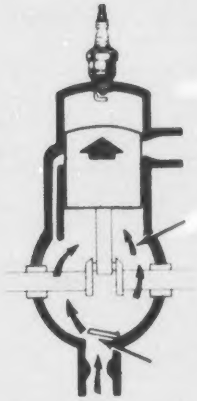


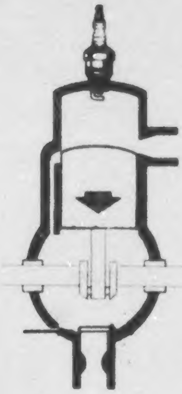


3) ______________________

4) ______________________

b. Two-stroke cycle engine





1) ______________________

2) ______________________

9. Identify the parts of the valve below by writing the correct names in the blanks provided.

a. ______________________________

b. ______________________________

c. ______________________________

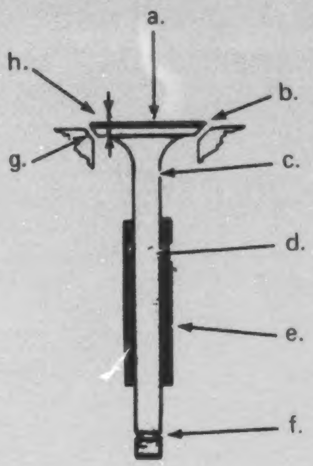
d. ______________________________

e. ______________________________

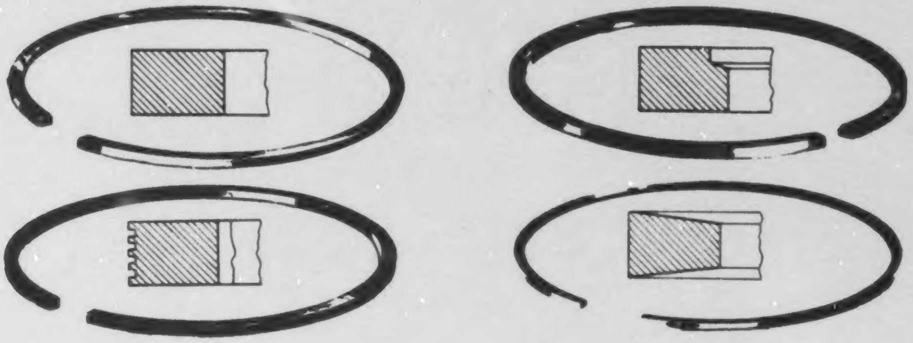
f. ______________________________

g. ______________________________

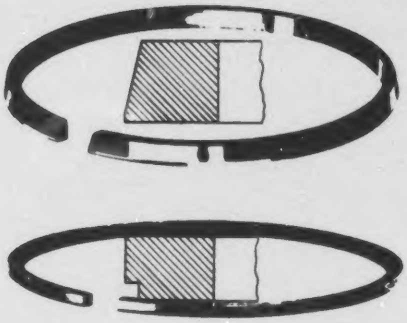
h. ______________________________

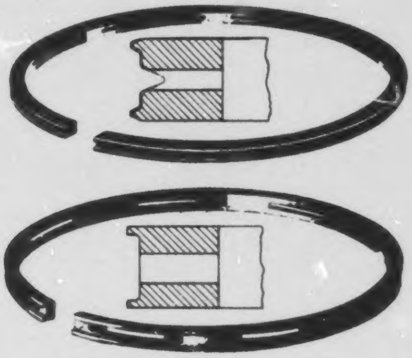


10. Identify the following kinds of rings by writing the correct names in the blanks provided.



a. ________________________





b. ______________________ c. ________________________

11. Match the kinds of rings to their specific purposes by writing the correct numbers in the blanks provided.

_____a. Regulate the amount of oil going to the compression rings and cylinder wall

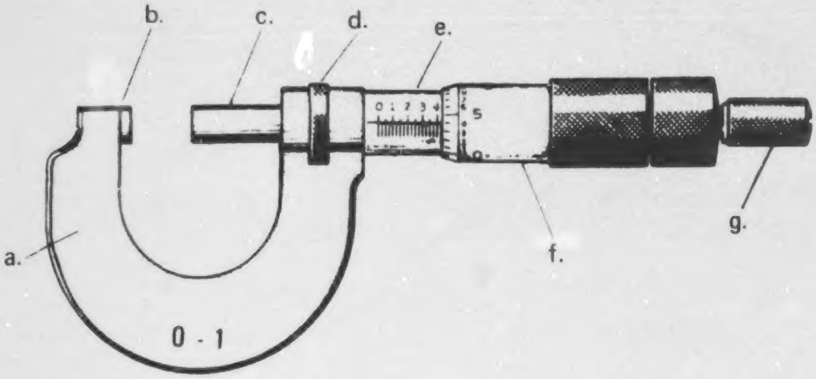
_____b. Make a tight seal against cylinder wall

_____c. Wipe excess oil off cylinder wall as piston moves down

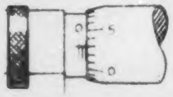
1. Compression rings
2. Oil scraper rings
3. Oil control rings

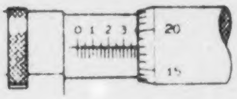
12. Identify the parts of the plain micrometer by writing the correct names in the blanks provided.

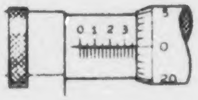
a. ____________________
b. ____________________
c. ____________________
d. ____________________
e. ____________________
f. ____________________
g. ____________________



13. Read the plain micrometer by writing the readings in the blanks provided.







a. ________________ b. ________________ c. ________________

14. Complete engine inspection chart.

15. Demonstrate the ability to:

    a. Disassemble, inspect, and reassemble a four-stroke cycle engine.

    b. Disassemble, inspect, and reassemble a two-stroke cycle engine.

    c. Reface valves and valve seats.

    d. Replace rings.

(NOTE: If activities 14-15 have not been accomplished prior to the test, ask your instructor when they should be completed.)

OVERHAULING SMALL GASOLINE ENGINES
UNIT II

ANSWERS TO TEST

1. a. 3
b. 8
c. 2
d. 7
e. 4
f. 10
g. 6
h. 1
i. 9
j. 11
k. 5
l. 16
m. 14
n. 19
o. 17
p. 18
q. 23
r. 26
s. 22
t. 24
u. 28
v. 13
w. 21
x. 25
y. 27
z. 15
aa. 20
bb. 12

2. a. Fuel tank
b. Plug wire
c. Spark plug
d. Cylinder head
e. Cylinder
f. Valve
g. Muffler
h. Valve guide
i. Carburetor
j. Valve spring
k. Push rod or tappet
l. Camshaft
m. Crankshaft
n. Oil fill plug
o. Crankcase
p. Connecting rod
q. Flywheel shroud
r. Piston
s. Piston pin
t. Piston rings
u. Engine block

3. a. Flywheel holder
b. Starter clutch wrench
c. Hone
d. Valve seat cutter
e. Valve guide reamer
f. Ring compressor
g. Ring expander
h. Ridge reamer
i. Small hole gauge
j. Micrometer
k. Valve spring compressor
l. Valve seat refacer

4. a. Vertical crankshaft
   b. Multiposition crankshaft
   c. Horizontal crankshaft
5. Any five of the following:
   a. Make of engine
   b. Model number or name of engine
   c. Serial number
   d. Type number
   e. Specification number
   f. Size
   g. rpm
6. Provides information for replacement parts or service
7. Description should include:
   a. Number of power strokes per crankshaft revolution
   b. Method of getting fuel-air mixture into combustion chamber
   c. Method of exhaust
   d. Method of lubricating the internal parts
8. a. Four-stroke cycle engine
      1) Power
      2) Exhaust
      3) Intake
      4) Compression
   b. Two-stroke cycle engine
      1) Intake-Compression
      2) Power-Exhaust

9. a. Head e. Guide
   b. Face f. Lock groove
   c. Neck g. Seat
   d. Stem h. Margin

10. a. Compression rings
    b. Oil scraper rings
    c. Oil control rings

11. a. 3
    b. 1
    c. 2

12. a. Frame e. Sleeve
    b. Anvil f. Thimble
    c. Spindle g. Ratchet stop
    d. Lock

13. a. 0.053
    b. 0.418
    c. 0.350

14. Evaluated to the satisfaction of instructor

15. Performance skills evaluated to the satisfaction of instructor

SERVICING SMALL ENGINES
UNIT III

UNIT OBJECTIVE

After completion o this unit, the student should be able to identify the different types of air cleaners, fuel filters, carburetors, and magnetos and demonstrate skills in servicing small gasoline engines. This knowledge will be evidenced by completion of the job sheets and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with servicing small engines to the correct definitions.
2. Name the solutions used in cleaning an engine.
3. Identify types of air cleaners.
4. Identify types of fuel filters.
5. Identify types of carburetors.
6. Identify types of magnetos.
7. Demonstrate the ability to:
    a. Clean and inspect crankcase and accessories.
    b. Clean and inspect cooling system.
    c. Service oil-bath air cleaner.
    d. Service oiled-filter air cleaner.
    e. Service dry-filter air cleaner.
    f. Service sediment bowl fuel strainer.
    g. Service screen type fuel strainer.
    h. Service crankcase breather.
    i. Change crankcase oil.
    j. Check spark plug for proper operation.

k. Clean and service spark plugs.

l. Replace ignition contact points and condenser on internal magneto.

m. Replace ignition contact points and condenser on external magneto.

n. Service float type carburetor.

SERVICING SMALL ENGINES
UNIT III

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

   A. Provide student with objective sheet.

   B. Provide student with information and job sheets.

   C. Make transparencies.

   D. Discuss unit and specific objectives.

   E. Discuss information sheet.

   F. Demonstrate and discuss procedures outlined in job sheets.

   G. Give test.

II. Instructional materials:

   A. Objective sheet

   B. Information sheet

   C. Transparency masters

      1. TM 1--Types of Air Cleaners

      2. TM 2--Types of Fuel Filters

      3. TM 3--Types of Carburetors

      4. TM 4--Types of Magnetos

   D. Job sheets

      1. Job Sheet #1--Clean and Inspect Crankcase and Accessories

      2. Job Sheet #2--Clean and Inspect Cooling Systems

      3. Job Sheet #3--Service Oil-Bath Air Cleaner

      4. Job Sheet #4--Service Oiled-Filter Air Cleaner

      5. Job Sheet #5--Service Dry-Filter Air Cleaner

      6. Job Sheet #6--Service Sediment Bowl Fuel Strainer

7. Job Sheet #7--Service Screen Type Fuel Strainer
8. Job Sheet #8--Service Crankcase Breather
9. Job Sheet #9--Change Crankcase Oil
10. Job Sheet #10--Check Spark Plug for Proper Operation
11. Job Sheet #11--Clean and Service Spark Plugs
12. Job Sheet #12--Replace Ignition Contact Points and Condenser on Internal Magneto
13. Job Sheet #13--Replace Ignition Contact Points on External Magneto
14. Job Sheet #14--Service Float Type Carburetor

E. Test

F. Answers to test

III. Unit references:

A. *Small Engine Care, Operation, Maintenance, and Repair.* Vol. 1. American Association for Agricultural Engineering and Vocational Agriculture.

B. *Briggs and Stratton Repair Instructions III.* Milwaukee, Wisconsin: Briggs and Stratton Corporation.

C. *General Theories of Operation.* Milwaukee, Wisconsin: Briggs and Stratton Corporation.

D. *Small Gasoline Engines Student Handbook.* University Park: Pennsylvania State University, College of Agriculture, Department of Agricultural Education.

SERVICING SMALL ENGINES
UNIT III

INFORMATION SHEET

I. Terms and definitions

  A. Butterfly (throttle) valve--Device located in the manifold which controls the fuel and air

  B. Choke valve--Gate or valve which allows passage of gas or fluid in one direction only; valve which provides a higher fuel-to-air ratio by restricting air inlet

  C. Spark gap--Space between the electrodes of a spark plug through which the spark jumps

  D. Detonation or knock--Hammering force on the piston rather than a uniform pushing force

  E. Air cleaner--Device for filtering, cleaning, and removing dust from the air admitted to a unit, such as an engine

  F. Carburetor--Device for automatically mixing fuel in the proper proportion with air to produce a combustible gas

  G. Magneto--Alternator with permanent magnets used to generate current for the ignition in an internal combustion engine

  H. Ignition contact points (breaker points)--Pair of points, one stationary and the other operated by a cam, to make and break the primary ignition circuit; usually made of tungsten, platinum, or silver

  I. Condenser--Device for temporarily collecting and storing a surge of electrical current for later discharge

II. Engine cleaning solutions

  A. Commercial solvent called *degreaser*

  B. Petroleum solvents

    1. Kerosene

    2. Diesel fuel

  C. Live steam

  D. Detergent solvent (car wash)

INFORMATION SHEET

III. Types of air cleaners (Transparency 1)

  A. Oil-bath

  B. Oiled-filter

  C. Dry-filter

IV. Types of fuel filters (Transparency 2)

  A. Combination screen and sediment bowl

  B. Screen in fuel tank

  C. Strainer on fuel pick-up hose

V. Types of carburetors (Transparency 3)

  A. Float

  B. Suction-lift

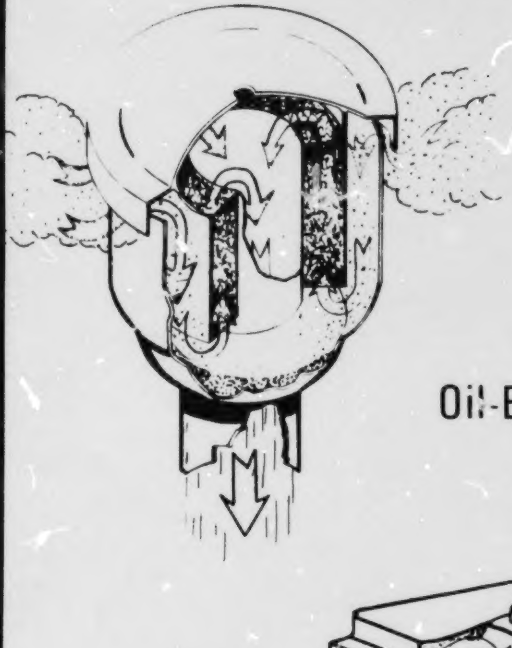
  C. Diaphragm

VI. Types of magnetos (Transparency 4)

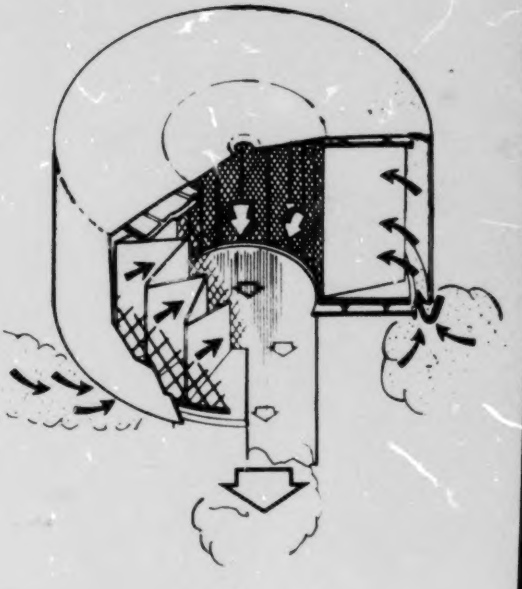
  A. Internal (flywheel) magneto

  B. External magneto

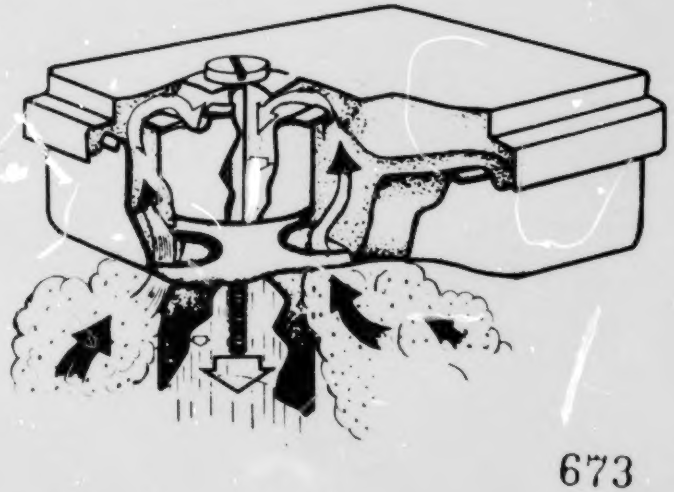
Types of Air Cleaners



Oil-Bath

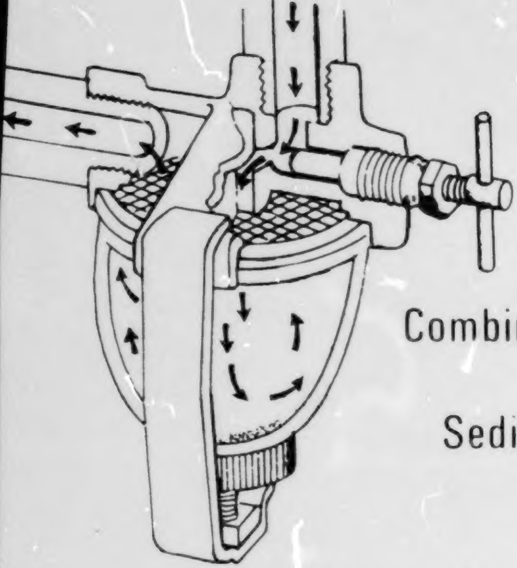


Dry-Filter

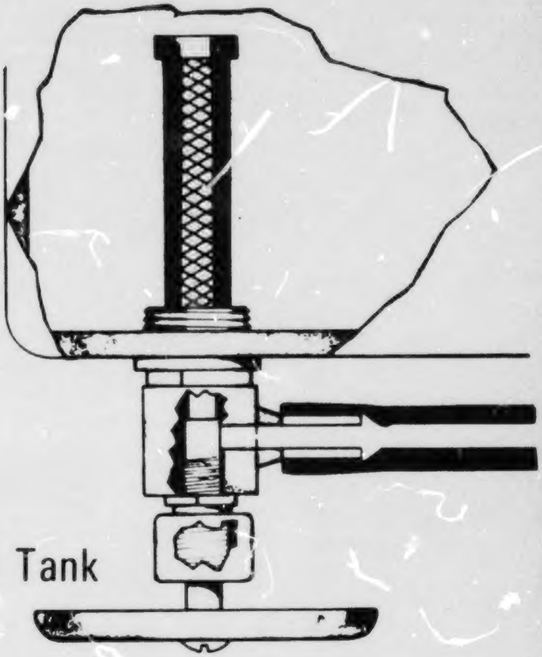


Oiled-Filter

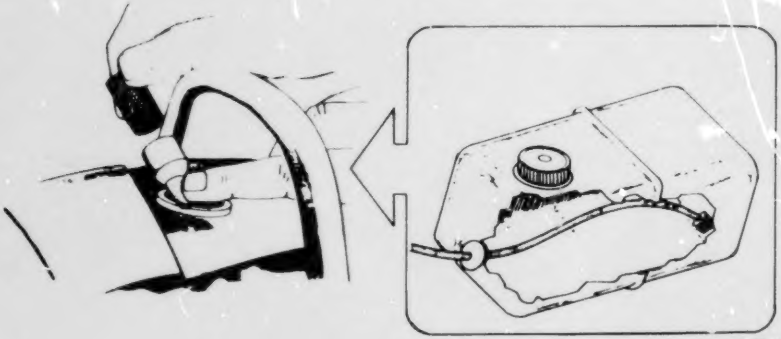
Types of Fuel Filters



Combination Screen
and
Sediment Bowl

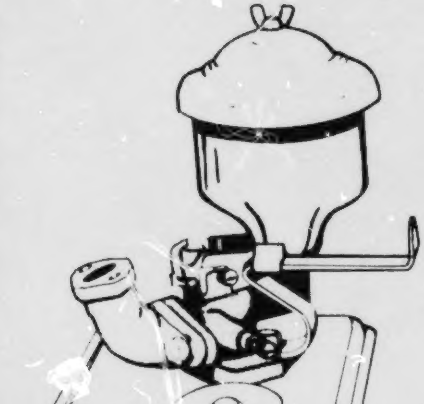


Screen in Fuel Tank

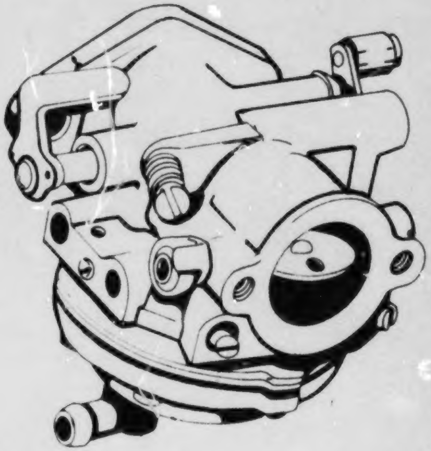


Strainer on Fuel
Pick-up Hose

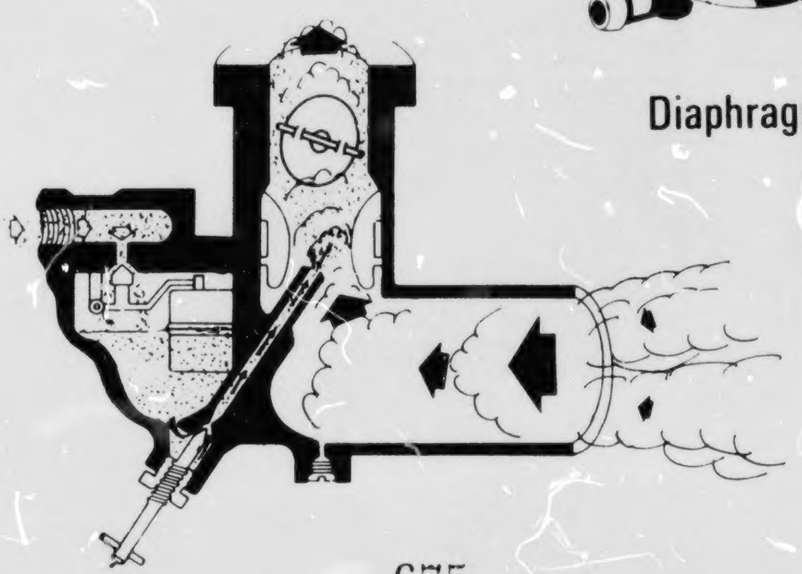
Types of Carburetors



Suction-Lift

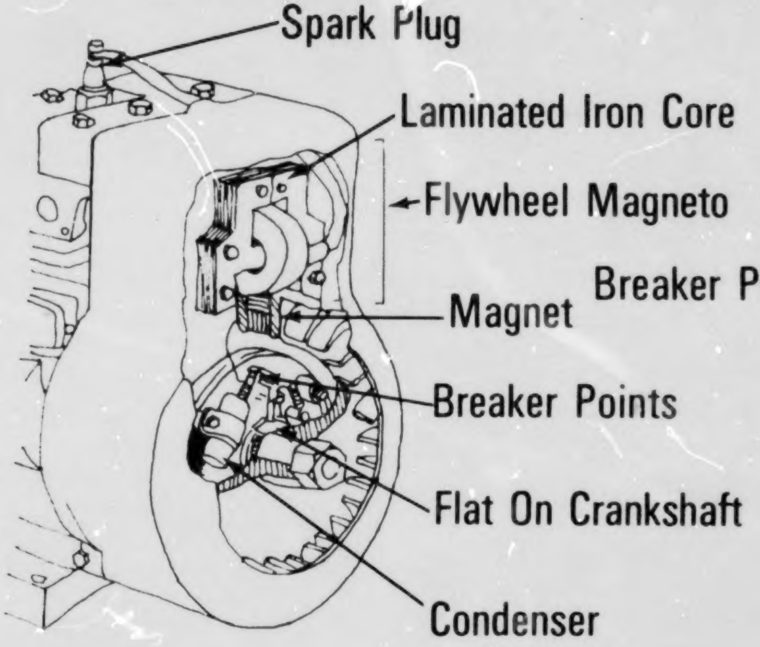


Diaphragm

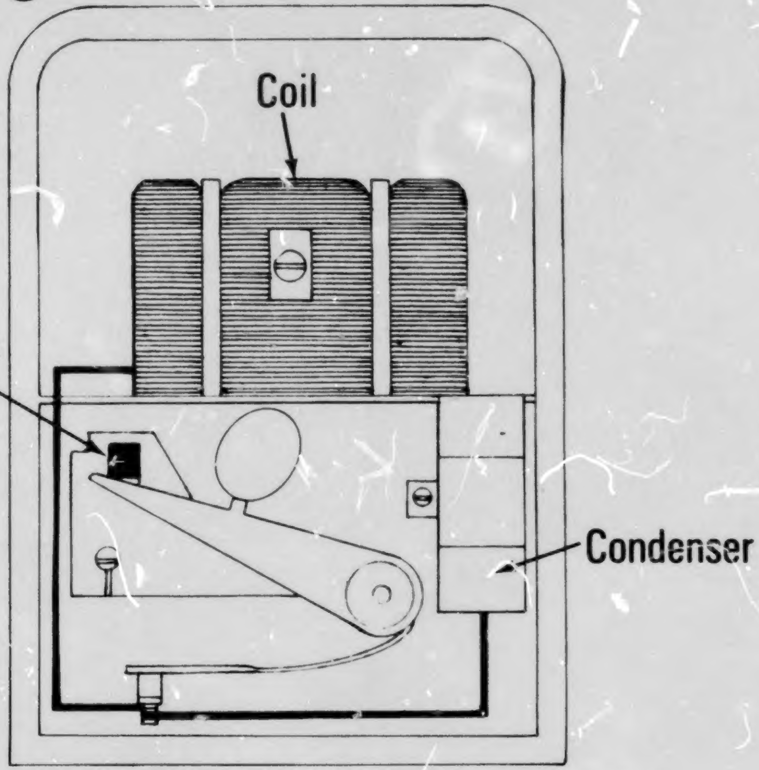


Float

Types of Magnetos



INTERNAL (FLYWHEEL)



EXTERNAL

SERVICING SMALL ENGINES
UNIT III

JOB SHEET #1--CLEAN AND INSPECT CRANKCASE AND ACCESSORIES

I. Tools and materials

   A. Standard screwdrivers, 4" and 6"

   B. Phillips screwdrivers, 4" and 6"

   C. Socket set including:

      1. 3/8"

      2. 7/16" (deep)

      3. 1/2"

      4. 5/8"

      5. 9/16"

      6. 3/8" ratchet

   D. Open-end wrenches same as sockets

   E. Wire brush

   F. Empty pan for cleaning solvent

   G. Paintbrush

   H. Water hose with nozzle

   I. Scraper or putty knife

   J. Solvent

   K. Hand sprayer

   L. Fire extinguisher

   M. Pressurized air

(NOTE: Do not use gasoline for cleaning an engine. It is highly flammable and an extreme fire hazard. If a degreaser is used, check the instructions on the can.)

JOB SHEET #1

II Procedure

A. Allow the engine to cool if it has been running

B. Remove the blower shroud and cylinder baffles

C. Inspect for oil and fuel leaks

D. Remove air cleaner and cover air cleaner opening

(NOTE: Cover carburetor intake with a piece of plastic sheeting. Use a rubber band to hold plastic in place.)

E. Clean the exhaust system

F. Apply solvent on areas that need cleaning

(NOTE: Apply with a paintbrush or hand sprayer until you notice a thin, well-distributed film.)

G. Allow solvent to set approximately five minutes

H. Remove solvent from the engine surface

1. If you used a degreaser, apply a strong stream of water
2. If you used a petroleum solvent, remove with a strong soap solution

I. Check for areas that have been missed

J. Remove protective covers

K. Replace carburetor air cleaner

L. Replace blower shroud and cylinder baffles

M. Start engine and operate for three to five minutes

SERVICING SMALL ENGINES
UNIT III

JOB SHEET #2--CLEAN AND INSPECT COOLING SYSTEM

I. Tools and materials

A. Standard screwdrivers, 4" and 6"

B. Phillips screwdrivers, 4" and 6"

C. Socket set

D. Open-end wrench set

E. Wire brush

F. Scraper or putty knife

G. Pressurized air

II. Procedure

A. Close the fuel shut-off valve

(NOTE: Not all engines have shut-off valves. If there is one, it may be either a part of the sediment bowl or a single unit.)

B. Remove fuel tank if necessary for removing the flywheel shroud

C. Remove the recoil starter or screened sheave if equipped with a self-starter

D. Remove the blower shroud

E. Remove remaining baffles and deflectors that direct air from shroud and over end area of cylinder

(NOTE: Do not operate the engine with the shroud and baffles removed.)

F. Clean inside of shroud and baffles with a small bristle brush or a putty knife

G. Clean intake screen by washing in solvent

H. Clean dirt from cylinder fins

I. Clean dirt from blower flywheel fins

J. Inspect engine for cracks, blemishes, and broken parts

K. Reassemble parts in reverse order

SERVICING SMALL ENGINES
UNIT III

JOB SHEET #3--SERVICE OIL-BATH AIR CLEANER

I. Tools and materials

  A. Standard screwdrivers, 4" and 6"

  B. Phillips screwdrivers, 4" and 6"

  C. Container for washing parts

  D. Clean rags

  E. Wooden scraper

  F. Paintbrush

  G. Solvent

  (NOTE: Do not use gasoline, naptha, or benzine. They are extremely flammable.)

  H. Pressurized air

II. Procedure

  A. Disconnect the spark plug wire

  B. Loosen oil cup or cover and remove the air cleaner

    1. Secured by bail wire

    2. Secured by wing nut

    3. Secured by threaded stud

  C. Cover the exposed air intake

  D. Check depth of sediment deposit in bottom of oil cups

  E. Throw away dirty oil

  F. Clean cup, filter, and other parts with solvents

  G. Check air intake pipe to the carburetor for dirt accumulation

  H. Refill cup with oil to Oil Level

  I. Remove cover from intake

  J. Assemble the air cleaner, install, and tighten

  K. Reconnect the spark plug wire

SERVICING SMALL ENGINES
UNIT III

JOB SHEET #4--SERVICE OILED-FILTER AIR CLEANER

I. Tools and materials

- A. Standard screwdrivers, 4" and 6"
- B. Phillips screwdrivers, 4" and 6"
- C. Container for washing parts
- D. Clean rags
- E. Soap
- F. Paintbrush
- G. Pressurized air

II. Procedure

- A. Disconnect the spark plug wire
- B. Clean area around air cleaner
- C. Remove filter element cover
- D. Remove filter element
- E. Check condition of the filter element and other parts of the air cleaner
- F. Cover carburetor air intake
- G. Clean filter
- H. Dry filter element
- I. Remove protective cover from the carburetor intake
- J. Clean the carburetor intake
- K. Oil the filter element with a few drops of oil
- L. Install filter element
- M. Install cover
- N. Reconnect spark plug wire

SERVICING SMALL ENGINES
UNIT III

JOB SHEET #5--SERVICE DRY-FILTER AIR CLEANER

I. Tools and materials

   A. Standard screwdrivers, 4" and 6"

   B. Phillips screwdrivers, 4" and 6"

   C. Clean rags

   D. Pressurized air

II. Procedure

   A. Disconnect the spark plug wire

   B. Clean the area around the air cleaner

   C. Remove the filter element cover

   D. Remove the air filter element

   E. Cover the carburetor air intake with cloth or plastic

   F. Check condition of filter element and other parts

   G. Clean air filter element

   (NOTE: If filter element is paper, clean by tapping it on a flat surface.)

   (CAUTION: Do not wash it unless instructed to do so by the manufacturer.)

   H. Remove protective cover from the carburetor intake

   I. Clean filter cover and carburetor intake

   J. Replace filter element

   K. Replace cover

   L. Reconnect spark plug wire

SERVICING SMALL ENGINES
UNIT III

JOB SHEET #6--SERVICE SEDIMENT BOWL FUEL STRAINER

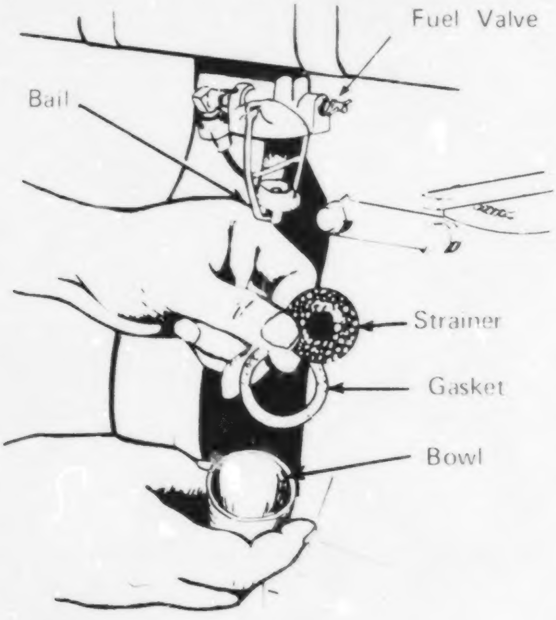
I. Tools and materials

- A. Open-end wrenches, 7/16" and 1/2"
- B. Combination pliers
- C. Solvents
- D. Pan for cleaning parts
- E. Cleaning rags
- F. New gasket for glass bowl
- G. Fire extinguisher
- H. Pressurized air

II. Procedure

- A. Disconnect spark plug wire
- B. Close fuel shut-off valve
- C. Loosen jam nut and swing the wire bail to one side (Figure 1)
- D. Remove bowl with a twisting motion (Figure 1)

FIGURE 1



JOB SHEET #6

E. Remove gasket (Figure 1)

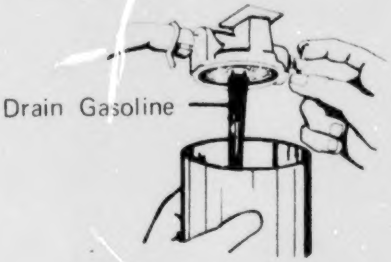
F. Remove strainer (filter) screen (Figure 1)

G. Wash the screen or filter element

H. Clean and then dry sediment bowl

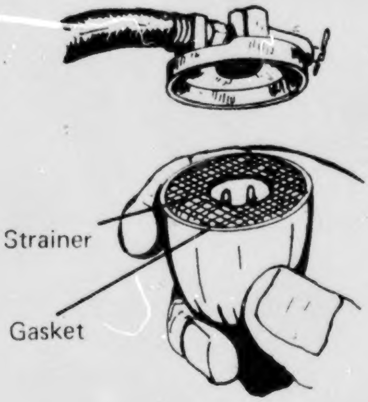
I. Open fuel valve and drain out approximately a cup of fuel (Figure 2) (NOTE: Collect fuel in can to avoid a fire hazard.)

FIGURE 2



J. Install gasket, strainer, and sediment bowl (Figure 3)

FIGURE 3



K. Fill the sediment bowl before tightening the jam nut

L. Tighten bowl against gasket with jam nut

M. Check for leaks before operating engine

N. Reconnect spark plug wire to spark plug

O. Operate engine for a few minutes and recheck for leaks

SERVICING SMALL ENGINES
UNIT III

JOB SHEET #7--SERVICE SCREEN TYPE FUEL STRAINER

I. Tools and materials

- A. Open-end wrenches, 7/16" and 1/2"
- B. Combination pliers
- C. Solvent
- D. Pan for cleaning parts
- E. Cleaning rags
- F. Fire extinguisher

II. Procedure

- A. Disconnect the spark plug wire
- B. Close fuel shut-off valve (if one is installed)
- C. Remove fuel line from tank
- D. Remove fuel shut-off valve and/or fuel strainer from fuel tank if possible
- E. Clean fuel strainer
- F. Replace fuel strainer assembly in reverse order of removal
- G. Reconnect spark plug wire to spark plug

SERVICING SMALL ENGINES
UNIT III

JOB SHEET #8--SERVICE CRANKCASE BREATHER

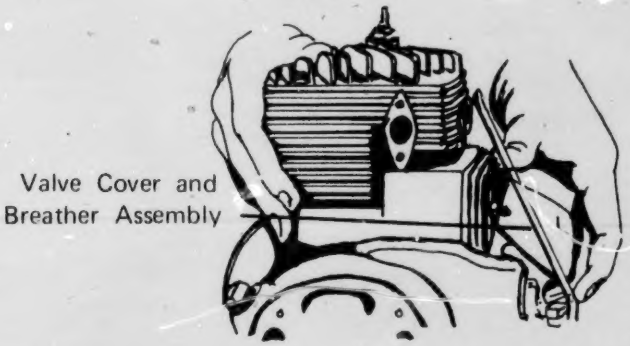
I. Tools and materials

- A. Open-end wrenches, 7/16" and 1/2"
- B. Standard screwdriver, 8"
- C. Combination pliers
- D. Clean rags
- E. Solvent
- F. Container for cleaning parts
- G. New gasket

II. Procedure

- A. Disconnect spark plug wire
- B. Check breather for proper operation
- C. Remove crankcase breather cover if installed (Figure 1)

FIGURE 1



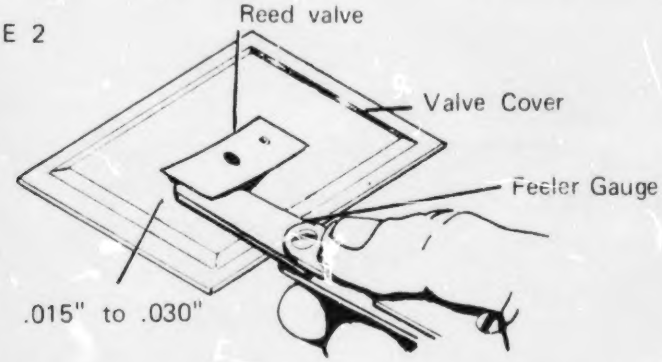
- D. Remove the crankcase breather if it is not a part of the cover

JOB SHEET #8

E. Check breather valve for clearance (Figure 2)

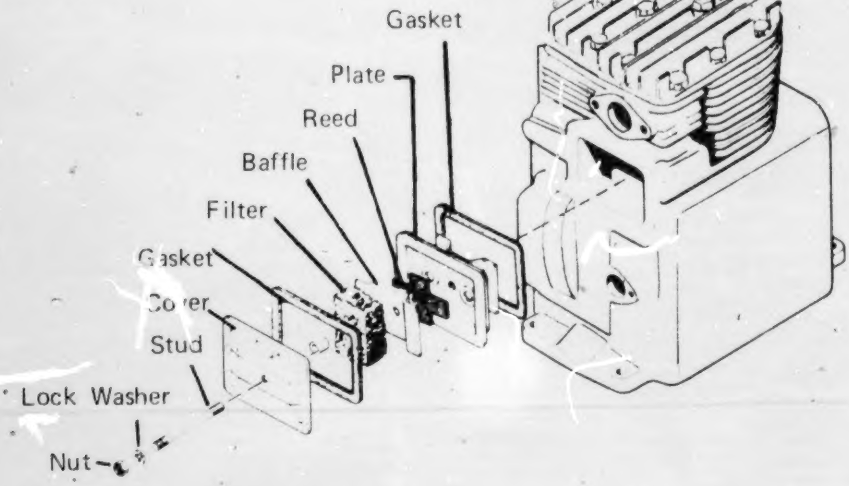
1. Check reed valves with a feeler gauge
2. Be sure clearance is from .015" to .030"

FIGURE 2



F. Disassemble crankcase breather (Figure 3)

FIGURE 3



G. Clean parts in petroleum solvent

H. Reassemble and install [illegible]

SERVICING SMALL ENGINES
UNIT III

JOB SHEET #9--CHANGE CRANKCASE OIL

I. Tools and materials

   A. Standard screwdriver, 8"

   B. Combination pliers

   C. End wrenches, 7/16", 1/2", 9/16", and 5/8"

   D. Funnel

   E. Oil as recommended

   F. Container for old oil

   G. Clean rags

   H. Fire extinguisher

II. Procedure

   A. Operate engine until it is thoroughly heated

   B. Stop engine and disconnect the spark plug wire

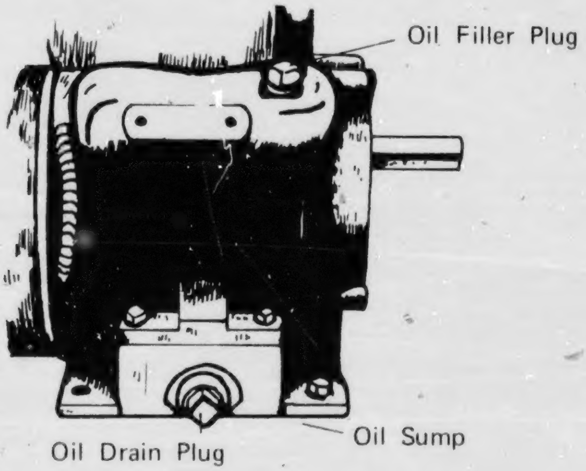
   C. Locate drain plug (Figure 1)

      1. Bottom of oil sump

      2. Under oil sump

      3. Some drained through filler neck

FIGURE 1



JOB SHEET #9

D. Clean dirt from around plug before removing plug

E. Remove drain plug

F. Allow crankcase to drain for approximately five minutes

G. Replace drain plug

H. Refill crankcase with new oil

(NOTE: Use type of oil recommended in the operator's manual.)

I. Connect spark plug wire and start engine

J. Check for oil leaks

K. Stop engine

L. Recheck oil level

SERVICING SMALL ENGINES
UNIT III

JOB SHEET #10--CHECK SPARK PLUG FOR PROPER OPERATION

I. Tools and materials

  A. Spark plug deep sockets, 13/16" x 3/8" and 3/4" x 3/8" drive

  B. Torque wrench, 3/8" drive

  C. Feeler gauge

  D. Ignition file

  E. Pen knife

  F. Wire brush

  G. Small paintbrush

  H. Pan of petroleum solvent

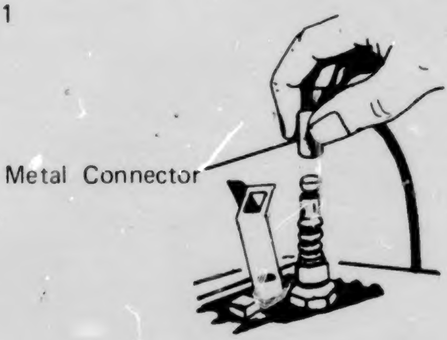
  I. Adjustable gap spark tester

  J. Fire extinguisher

II. Procedure

  A. Disconnect the spark plug wire from the spark plug (Figure 1)

FIGURE 1

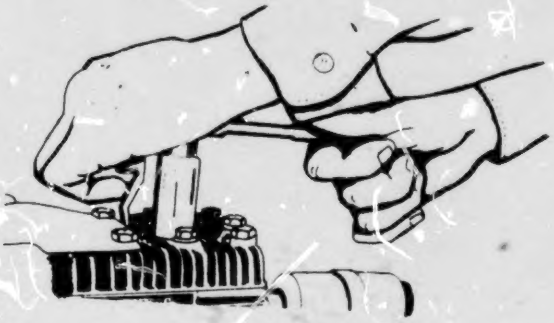


  B. Loosen plug one or two turns and then remove dirt

JOB SHEET #10

C. Remove the spark plug (Figure 2)

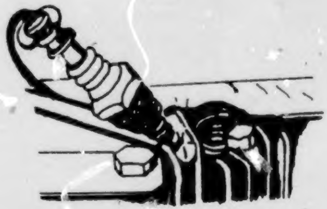
FIGURE 2



D. Reconnect the spark plug wire

E. Ground spark plug to the engine (Figure 3)

FIGURE 3



F. Crank the engine one or two turns

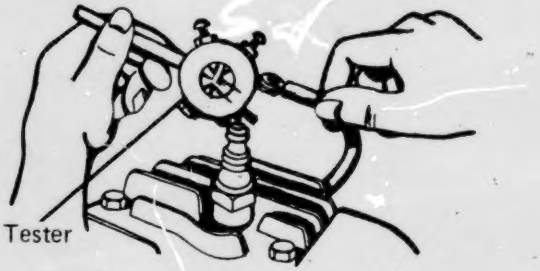
G. Observe the spark at the electrode

(NOTE: If there is no spark or if spark is weak, proceed to next step.)

H. Disconnect the spark plug wire from the spark plug

I. Hold end of the spark plug wire approximately 1/4 inch from the cylinder head or use a spark tester (Figure 4)

FIGURE 4



Adjustable Gap Spark Tester

JOB SHEET #10

J. Crank the engine one or two turns

K. Observe the spark between spark plug wire and the cylinder head

(NOTE: If the spark is blue-orange color, the ignition system is okay; the trouble is in the spark plug.)

SERVICING SMALL ENGINES
UNIT III

JOB SHEET #11--CLEAN AND SERVICE SPARK PLUGS

I. Tools and materials

   A. Spark plug deep sockets, 13/16" x 3/8" and 3/4" x 3/8" drive

   B. Torque wrench, 3/8" drive

   C. Feeler gauge

   D. Ignition file

   E. Pen knife

   F. Wire brush

   G. Small paintbrush

   H. Pan of petroleum solvent

   I. Fire extinguisher

II. Procedure

   A. Check the condition of the plugs

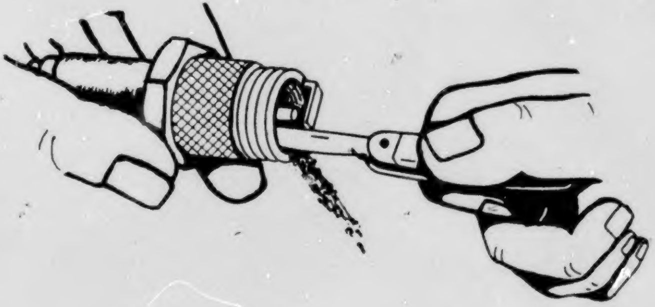
   B. Remove oil deposits from plugs

   C. Clean threads with wire brush

   (NOTE: Do not brush the insulator. It will leave a metallic film which may provide an electrical short to ground.)

   D. Remove deposits from plugs (Figure 1)

FIGURE 1



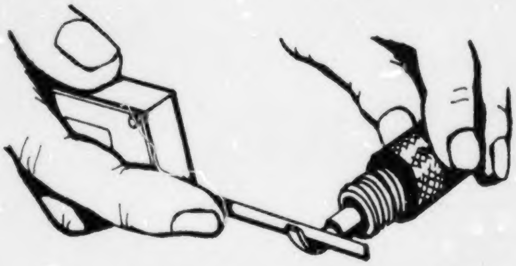
JOB SHEET #11

E. Blow loose materials from plug with compressed air

F. Bend the ground electrode enough to allow room for a thin point file (Figure 2)

(NOTE: Bend just enough to allow room for file. Too much bending will break the ground electrode.)

FIGURE 2



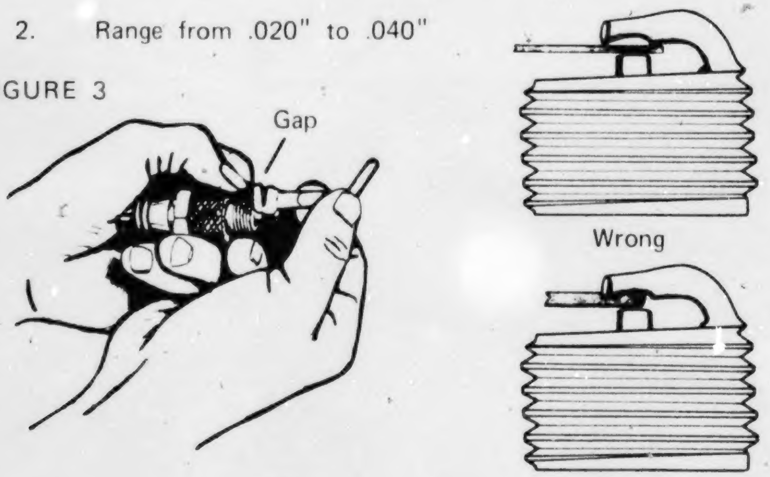
G. File electrodes on plugs until both have flat surfaces (Figure 2)

H. Bend the ground electrode back into its original position

I. Determine proper spark gap spacing for your engine (Figure 3)

1. Most plugs set on .025 inch
2. Range from .020" to .040"

FIGURE 3



Wrong

Right

SERVICING SMALL ENGINES
UNIT III

JOB SHEET #12--REPLACE IGNITION CONTACT POINTS AND CONDENSER ON INTERNAL MAGNETO

I. Tools and materials

   A. Socket set, 3/8" drive

   B. Combination wrench set

   C. Standard screwdriver

   D. Soft hammer

   E. Flywheel holding tool

   F. Flywheel puller

   G. Fire extinguisher

   H. Feeler gauge

II. Procedure

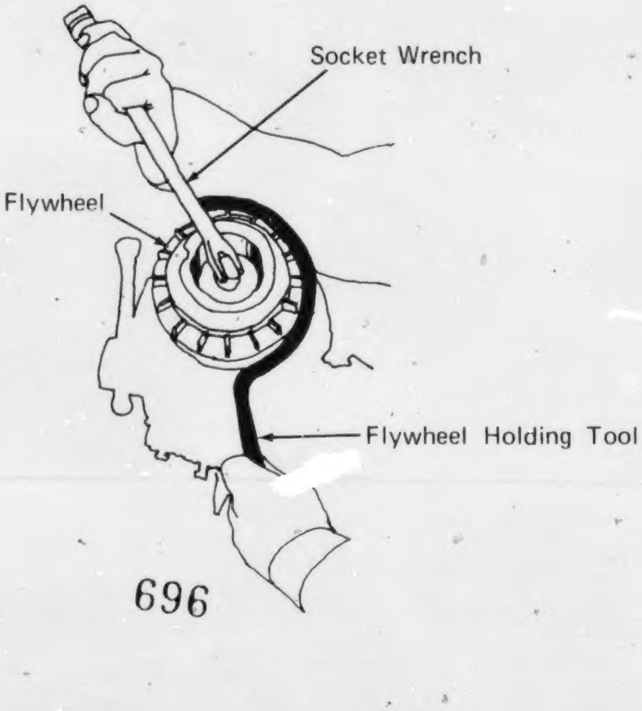
   A. Disconnect spark plug wire

   B. Disconnect fuel line

   C. Remove flywheel shroud and fuel tank; rewind starter

   D. Remove flywheel nut (Figure 1)

FIGURE 1



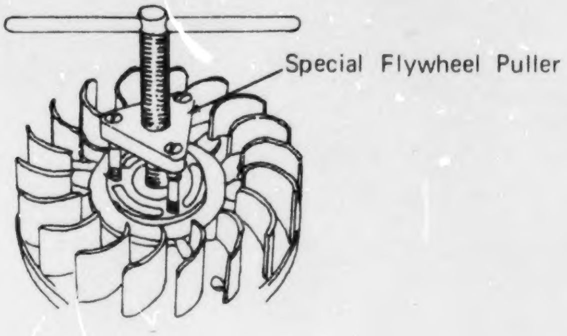
JOB SHEET #12

E. Remove the flywheel by one of these two methods

1. Attach flywheel puller and remove flywheel (Figure 2)

   (NOTE: Care should be taken not to damage the crankshaft threads.)

FIGURE 2



2. Remove flywheel from a tapered shaft only (Figure 3)

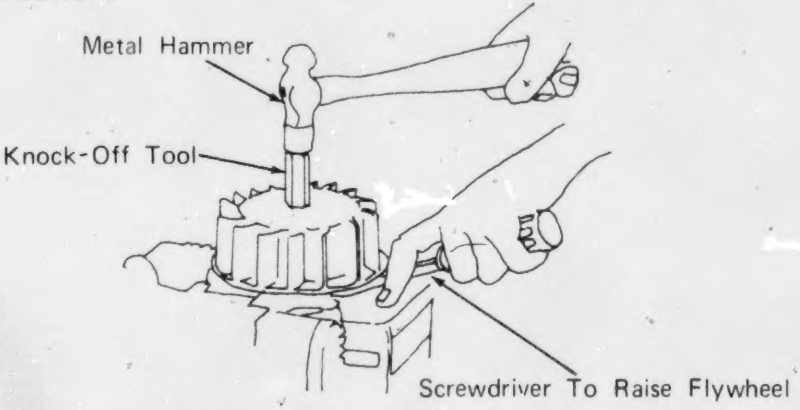
   a. Place knock-off tool on end of crankshaft

   b. Hold pressure on flywheel by hand or pry it

   c. Strike end of knock-off tool with a sharp blow

   (NOTE: Do not strike the knock-off tool more than three to four times because it could knock the magnetism out of the flywheel.)

FIGURE 3



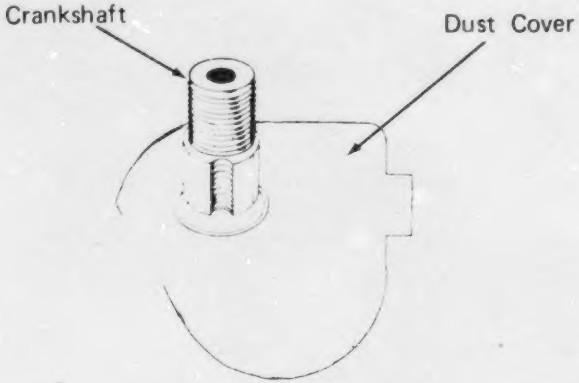
JOB SHEET #12

F. Clean the area of the engine covered by the flywheel

G. Remove the ignition dust cover (Figure 4)

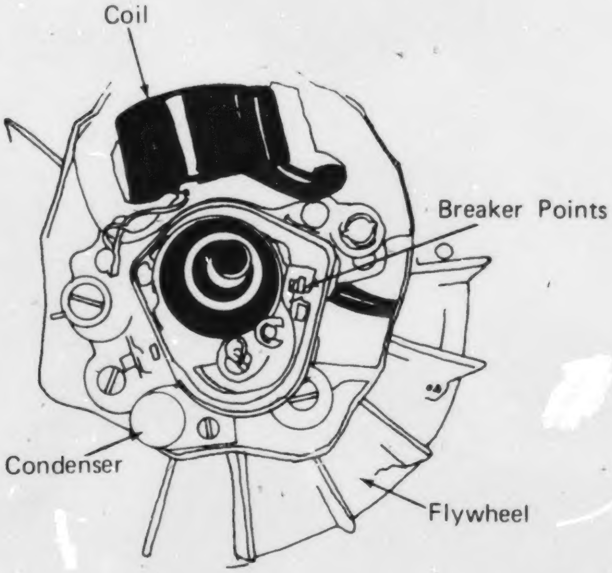
(NOTE: On some models it will be necessary to remove the centrifugal spark advance mechanism before removing the dust cover.)

FIGURE 4



H. Remove the points and condenser (Figure 5)

FIGURE 5



JOB SHEET #12

I. Inspect the crankshaft seal for oil leaks

J. Check for worn crankshaft bearings

K. Inspect the point cam area on the crankshaft

L. Inspect the ignition switch wire for proper insulation and proper routing

(NOTE: Some machinery is equipped with a safety shut-off switch that needs to be inspected for proper operation.)

M. Inspect the magneto coil for

1. Good ground connection
2. Insulation for cracks or overheated spots
3. Spark plug wire insulation and proper routing

N. Inspect the flywheel for

1. Keyway condition (Figure 6)
2. Key condition (Figure 6)

(NOTE: A partially sheared key or enlarged keyway will cause a weak ignition spark. See Figure 7.)

FIGURE 6

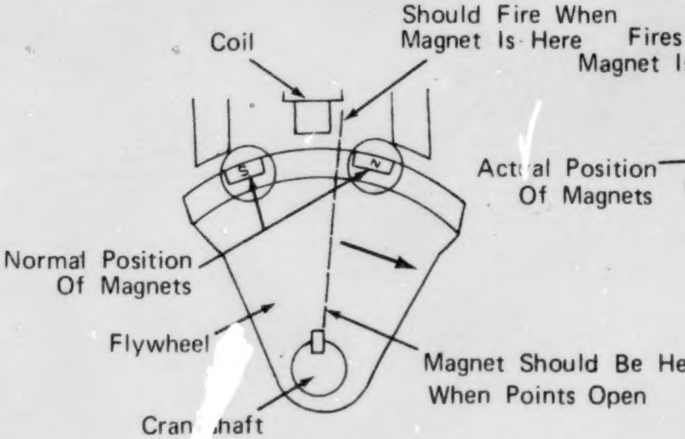
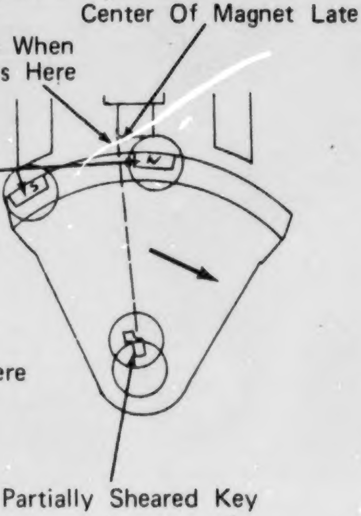

Coil
Should Fire When Magnet Is Here
S
N
Normal Position Of Magnets
Flywheel
Magnet Should Be Here When Points Open
Crankshaft

FIGURE 7



JOB SHEET #12

3. Interference with the coil armature

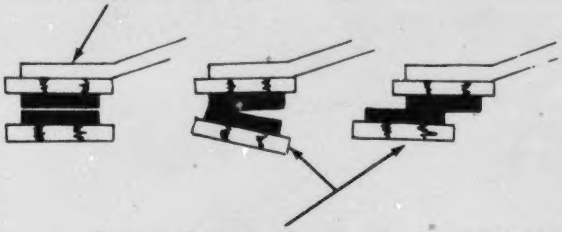
4. Strong magnetic pull

O. Install the ignition points and condenser

P. Lubricate the point rubbing block

Q. Align contact surfaces on points (Figure 8)

FIGURE 8

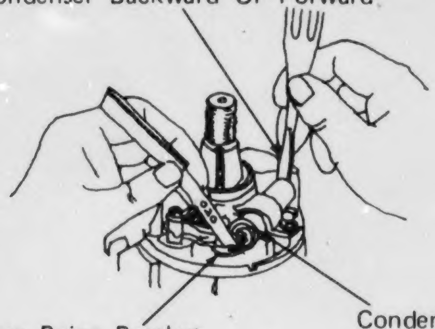

Breaker Points Should Fit Together Squarely To Keep Down Wear
Partial Contact Causes Arcing And Uneven Wear

R. Turn the crankshaft in the direction of normal rotation until cam opens breaker points to the widest position

S. Adjust the point gap

1. Loosen condenser clamp and move condenser to adjust gap (Figure 9)

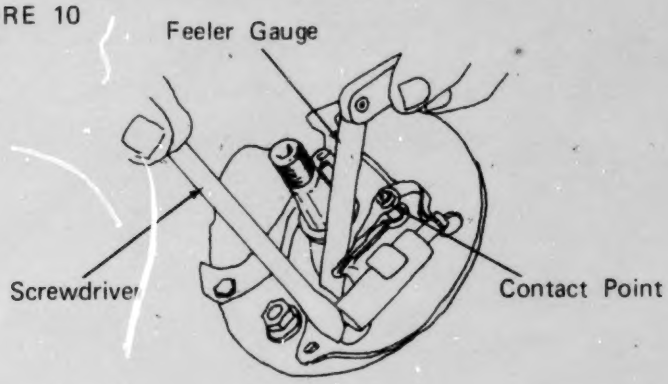
FIGURE 9



JOB SHEET #12

2. Loosen retaining screw on stationary point just enough to slide point on breaker plate to adjust gap (Figure 10)

FIGURE 10



T. Rotate the crankshaft four or five turns and watch point for proper operation

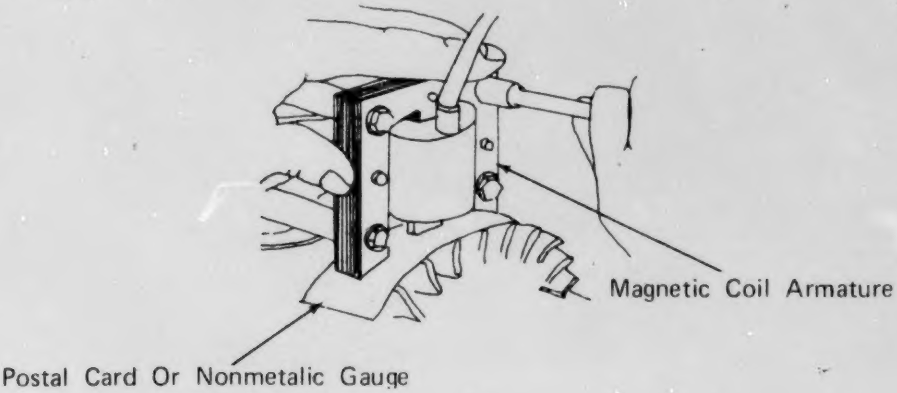
U. Install ignition dust cover and ignition advance mechanism if so equipped

V. Install flywheel and torque the retaining nut

W. Adjust the magneto armature air gap to .005" - .010"

(NOTE: A postal card is a good gauge to use for this adjustment. See Figure 11.)

FIGURE 11



JOB SHEET #12

X. Replace flywheel shroud, fuel tank, and rewind starter assembly

Y. Connect fuel line

Z. Connect spark plug wire

SERVICING SMALL ENGINES
UNIT III

JOB SHEET #13--REPLACE IGNITION CONTACT POINTS AND CONDENSER ON EXTERNAL MAGNETO

I. Tools and materials

   A. Socket set, 3/8" drive

   B. Combination wrench set

   C. Standard screwdriver

   D. Timing light

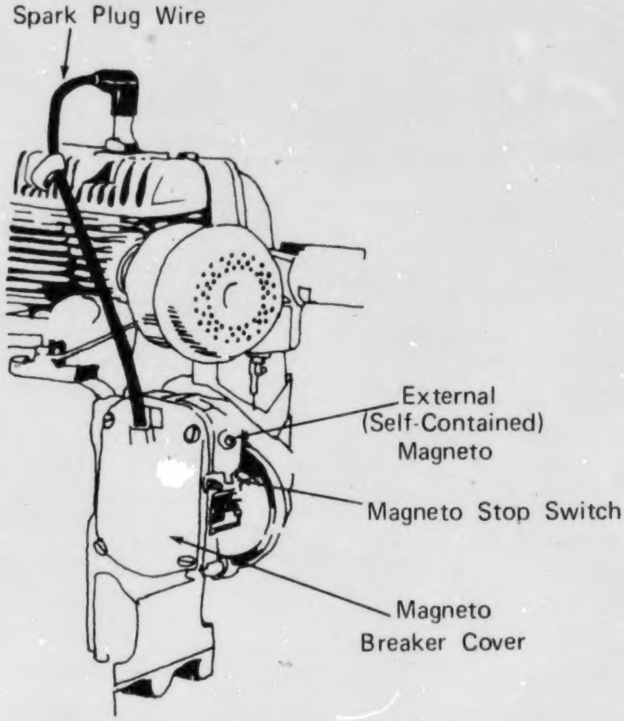
   E. Fire extinguisher

   F. Feeler gauge

II. Procedure

   A. Remove any equipment or engine accessories necessary to allow easy access to the magneto (Figure 1)

FIGURE 1



JOB SHEET #13

B. Clean magneto breaker cover and some working area around it (Figure 1)

C. Remove the breaker cover

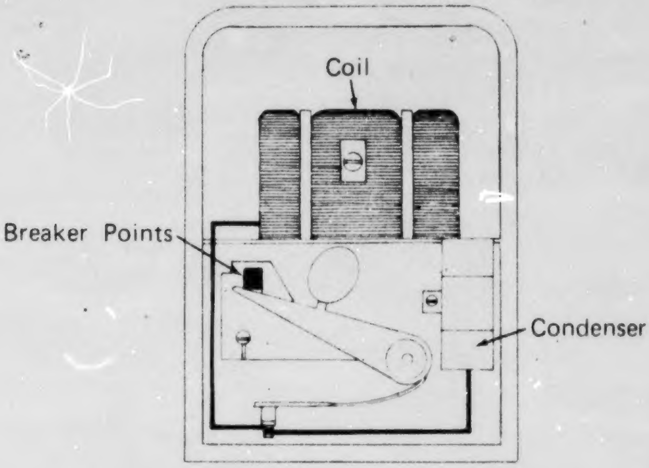
D. Clean and inspect the cover for cracks, spark paths, and a good seal to magneto case

E. Inspect the spark plug wire connections and insulation

(NOTE: Use a continuity light to test wire connections.)

F. Remove breaker points and condenser (Figure 2)

FIGURE 2



G. Clean the inside of the magneto

H. Lubricate the breaker cam

I. Install the new breaker points and condenser (Figure 2)

J. Rotate the engine in the normal direction of operation until the breaker points are open to the widest position

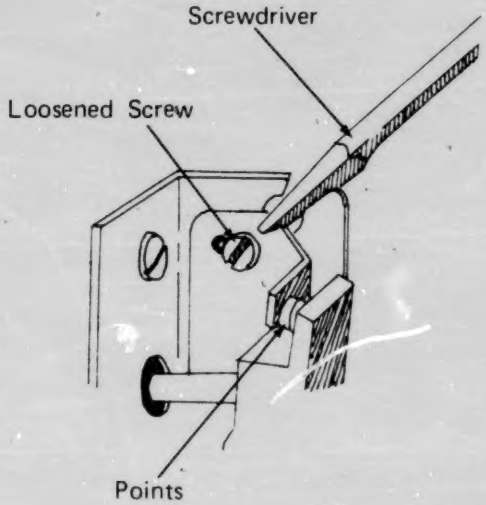
JOB SHEET #13

K. Adjust breaker point gap

1. Loosen the point retaining screw just enough to enable the stationary point to be moved by prying but maintain its position until adjustment is completed

2. Gauge and adjust the distance between the two breaker points with a wire feeler gauge so that the gauge has a very light drag and the movable point does not move when the gauge is pulled out (Figure 3)

FIGURE 3



3. Retighten the retaining screw

4. Rotate the engine several times and recheck the breaker point gap

L. Replace the magneto cover

(NOTE: Be sure the cover makes a good seal with the magneto case so it will seal against dirt and moisture.)

JOB SHEET #13

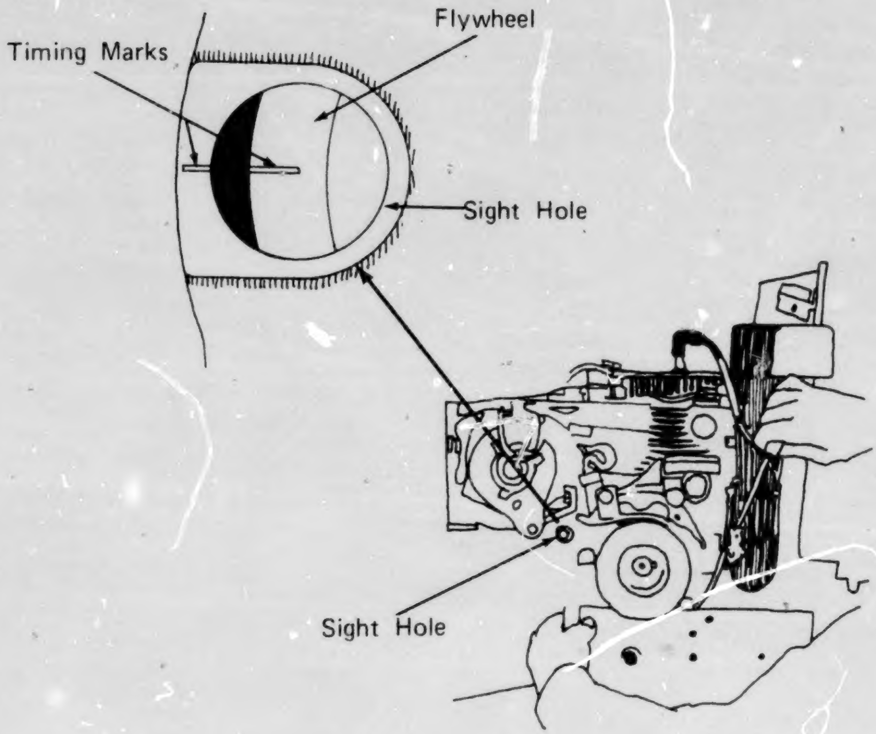
M. Time the magneto to the engine

1. Connect the heavy insulated lead of the timing light in series with the spark plug wire (Figure 4)

2. Connect primary leads to battery posts or to twelve volt supply

3. Locate the timing marks and clean so they can be easily seen (Figure 4)

FIGURE 4

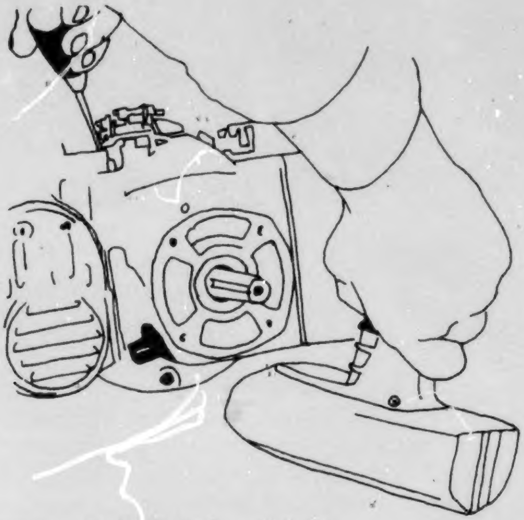


4. Start the engine and adjust the idle to approximately 1,000 rpm

JOB SHEET #13

5. Hold the timing light so that it will flash on the timing marks (Figure 5)

FIGURE 5



6. Loosen the magneto attaching bolts slightly

7. Rotate the magneto case in either direction until the timing marks align; retighten the attaching bolts

   (NOTE: If the timing cannot be set correctly by rotating the magneto it will be necessary to readjust the points until the timing marks align.)

8. Disconnect the timing light

N. Replace any equipment or engine accessories removed to allow access to the magneto

SERVICING SMALL ENGINES
UNIT III

JOB SHEET #14--SERVICE FLOAT TYPE CARBURETOR

I. Tools and materials

   A. Combination wrench set

   B. Socket set, 3/8" drive

   C. Standard screwdriver set

   D. Phillips screwdriver set

   E. Needlenose pliers

   F. Steel ruler, 6"

   G. Suitable carburetor cleaning fluid

   H. Parts cleaning basket

   I. Fire extinguisher

II. Procedure

   A. Close fuel shut-off valve

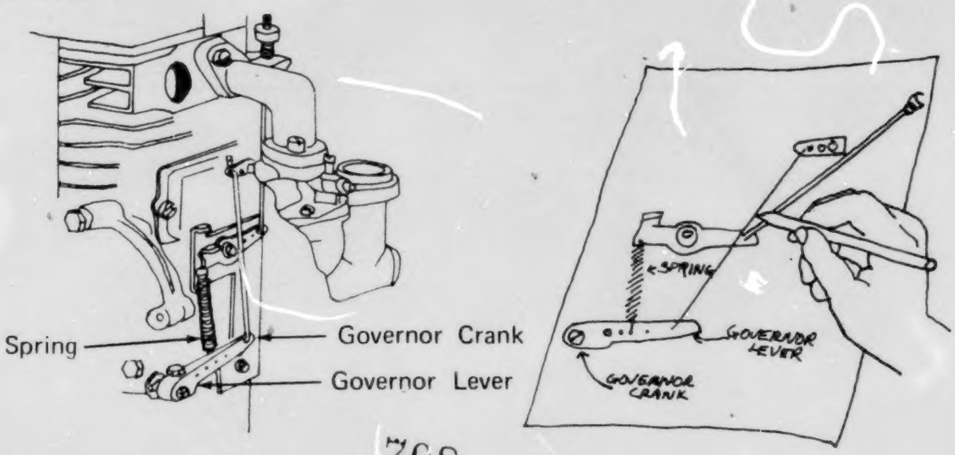
   B. Disconnect fuel line

   C. Disconnect throttle and choke cable

   D. Disconnect governor linkage

   (NOTE: It is recommended that you make a sketch of the linkages and their positions to aid reassembly. See Figure 1.)

FIGURE 1

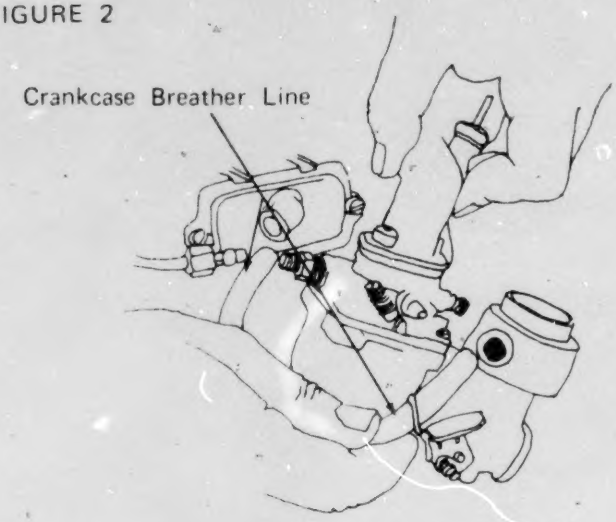


JOB SHEET #14

E. Remove the carburetor

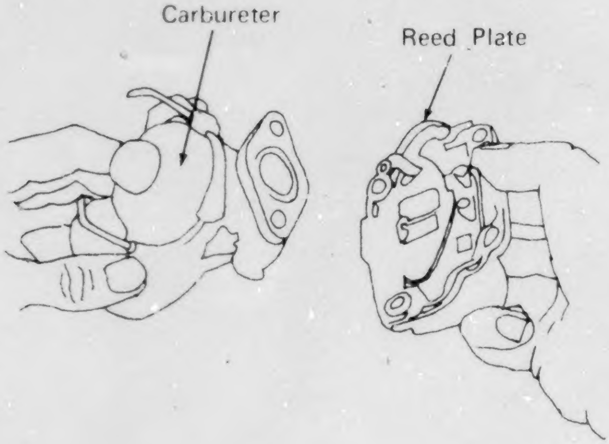
(NOTE: Some models have a breather return hose to disconnect. See Figure 2.)

FIGURE 2



F. Remove the intake valve plate from the carburetor on some two-cycle engines (Figure 3)

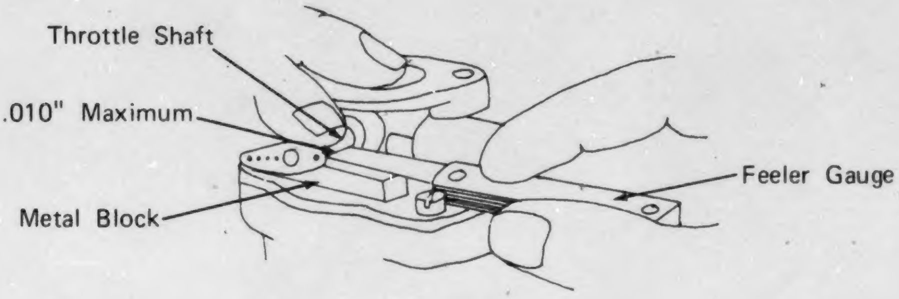
FIGURE 3



JOB SHEET #14

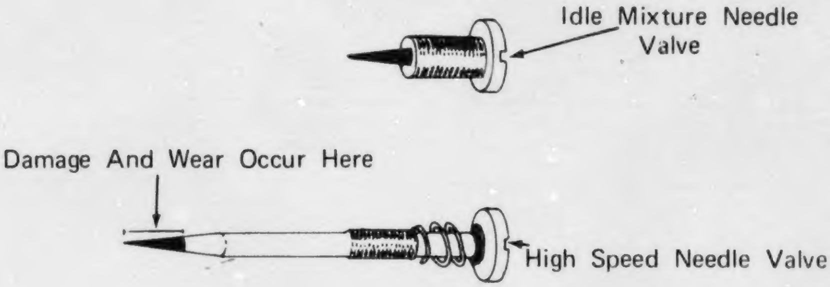
G. Check throttle shaft bushing for wear (Figure 4)

FIGURE 4



H. Remove and check the condition of the high speed and idle speed needle valves (Figure 5)

FIGURE 5

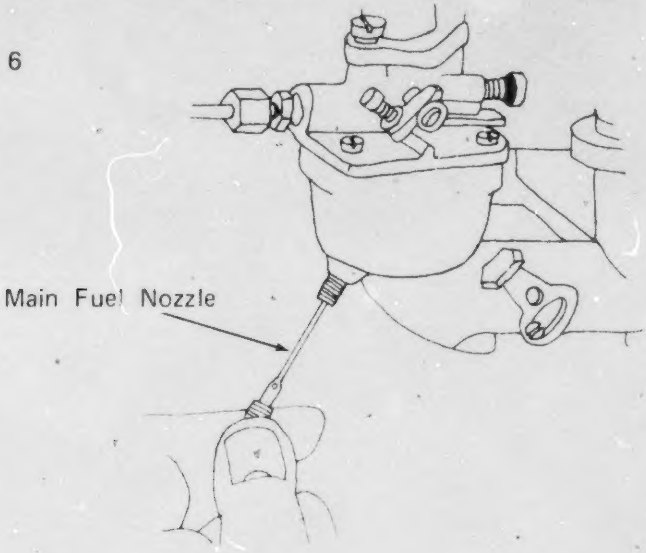


JOB SHEET #14

I. Remove the float bowl

(NOTE: On two-piece carburetor, remove the main fuel nozzle before removing float bowl. See Figure 6.)

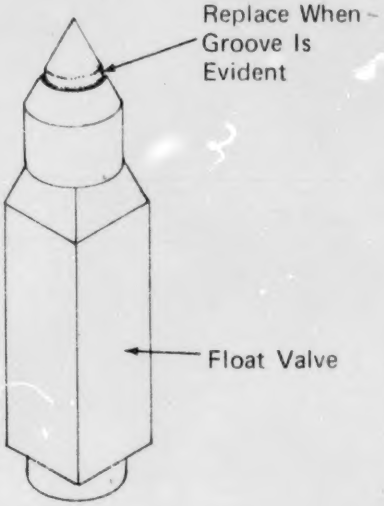
FIGURE 6



J. Remove float hinge pin and remove float

K. Remove float valve and inspect for wear; replace if a groove is worn in the tapered point of the valve (Figure 7)

FIGURE 7

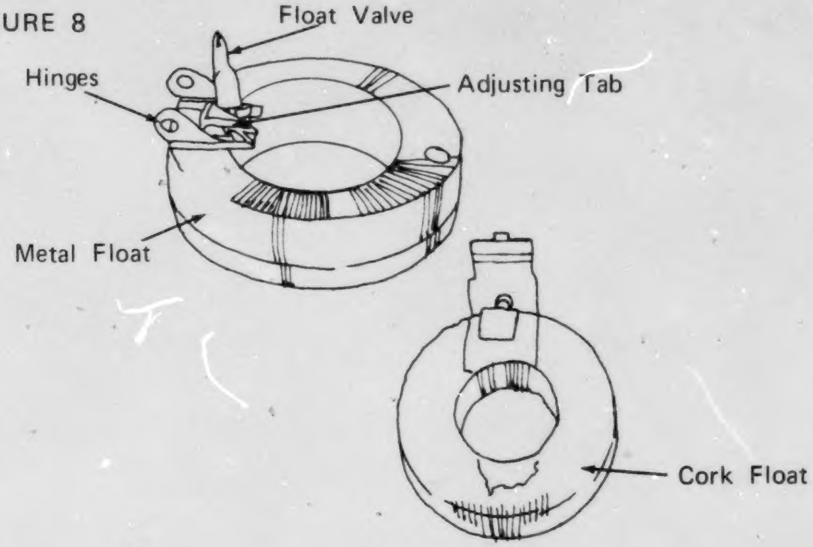


JOB SHEET #14

L. Inspect the floats for

1. Worn hinges
2. Fuel in metal floats; replace if you feel a liquid inside the float
3. Good varnish coating on cork floats; replace the float if the varnish is pealing or has been punched (Figure 8)

FIGURE 8



M. Remove all gaskets and/or rubber parts on the carburetor

N. Place all the carburetor parts except the gaskets, float, and rubber parts in a cleaner basket

O. Place the basket in the carburetor cleaner and gently move it up and down to circulate the cleaner through the parts; then let it set for approximately one hour

P. Remove the basket from the cleaner

Q. Rinse the parts and basket thoroughly with water

R. Dry the parts, one at a time, with compressed air

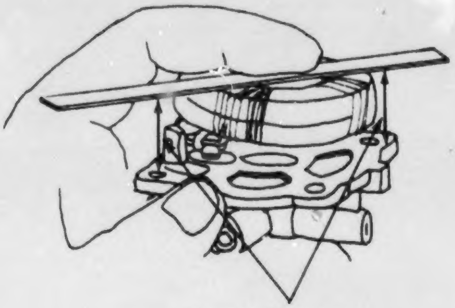
(NOTE: Be sure to blow out all passages in the carburetor body.)

S. Replace float valve and float on the carburetor body

JOB SHEET #14

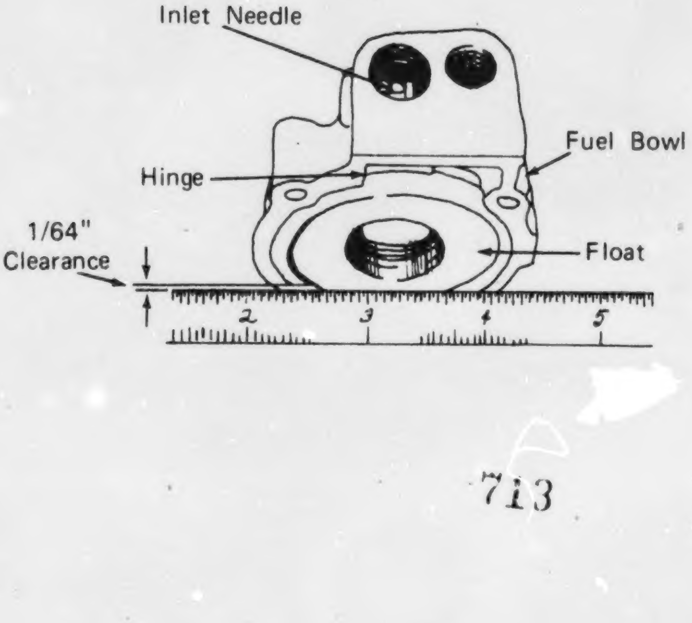
T. Adjust the float level by bending the tab and measuring correct height with a steel ruler (Figure 9)

FIGURE 9


Same Distance

U. Check distance from carburetor to float top for proper height and equal distance on horizontal float (Figure 10)

FIGURE 10

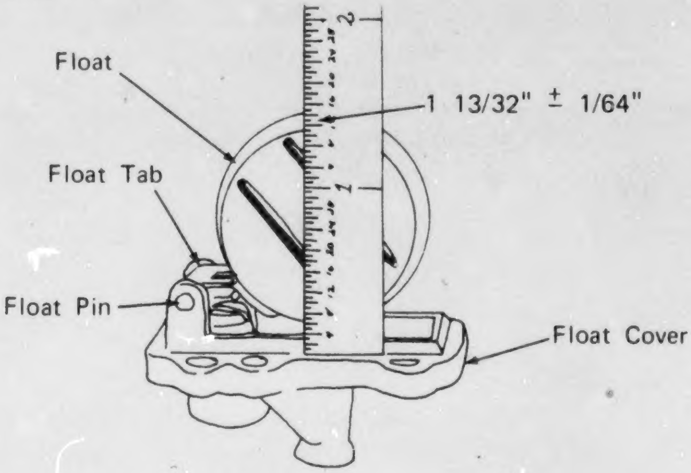


JOB SHEET #14

V. Check distance on a vertical float from carburetor top to top of float

(NOTE: Float should be true vertical to the carburetor top to prevent interference with float bowl walls. See Figure 11.)

FIGURE 11



W. Check bottom of float for proper clearance in relation to float bowl

X. Install new float bowl gasket and attach bowl to carburetor top

Y. Install idle mixture valve and screw it down until it is lightly seated; then back it out approximately two turns

(NOTE: Install the main fuel nozzle on the two-piece carburetor.)

Z. Install the high speed valve and screw it down until it is lightly seated; then back it out approximately two turns

(NOTE: Steps Y and Z are preliminary adjustments only and will be completed with the engine running.)

AA. Check for free operation of the throttle and choke valve

BB. Install the carburetor on the engine

CC. Reconnect the governor linkage according to the diagram sketched earlier

DD. Reconnect throttle and choke linkage

JOB SHEET #14

EE. Reconnect fuel line

FF. Open fuel shut-off valve and watch float bowl area of the carburetor for fuel leaks

(NOTE: Occasionally the float valve will get contamination in it that will keep it from shutting off. In this case, a few light taps on the valve area will release the contamination and solve the problem.)

GG. Start the engine and operate until it is at normal operating temperature

HH. Adjust idle speed

II. Adjust the idle mixture valve to the highest and smoothest rpm at idle speed

(NOTE: It may be necessary to reset the idle speed again.)

JJ. Accelerate the engine up to governor-controlled rpm and adjust high speed valve to highest and smoothest rpm

SERVICING SMALL ENGINES
UNIT III

TEST

NAME ______________________________ SCORE ____________________

1. Match terms on the right to the correct definitions by placing the appropriate numbers in the blanks provided.

_____a. Device located in the manifold which controls the fuel and air

_____b. Gate or valve which allows passage of gas or fluid in one direction only; valve which provides a higher fuel-to-air ratio by restricting air inlet

_____c. Space between the electrodes of a spark plug through which the spark jumps

_____d. Hammering force on the piston rather than a uniform pushing force

_____e. Device for filtering, cleaning, and removing dust from the air admitted to a unit, such as an engine

_____f. Device for automatically mixing fuel in the proper proportion with air to produce a combustible gas

_____g. Alternator with permanent magnets used to generate current for the ignition in an internal combustion engine

_____h. Pair of points, one stationary and the other operated by a cam, to make and break the primary ignition circuit; usually made of tungsten, platinum, or silver

_____i. Device for temporarily collecting and storing a surge of electrical current for later discharge

1. Condenser
2. Magneto
3. Air cleaner
4. Butterfly (throttle) valve
5. Spark gap
6. Choke valve
7. Ignition contact points (breaker points)
8. Detonation or knock
9. Carburetor

2. Name four solutions used in cleaning an engine.

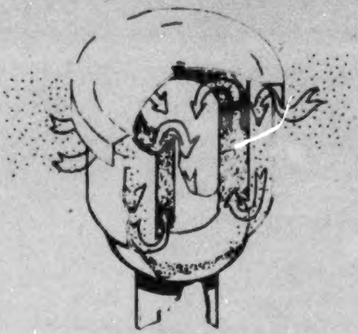
a. ____

b. ____

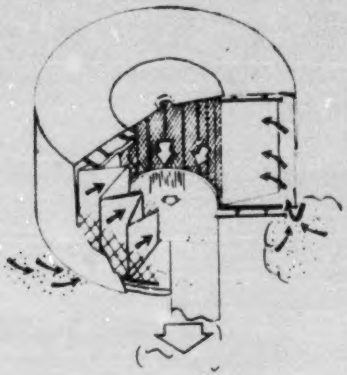
c. ____

d. ____

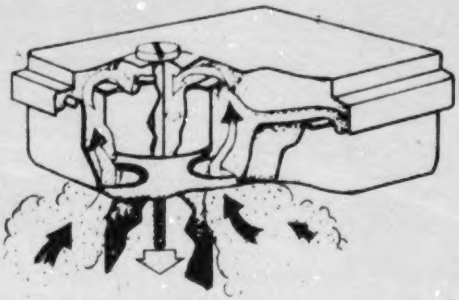
3. Identify the following types of air cleaners by writing the appropriate names in the blanks provided.



a. ____________________



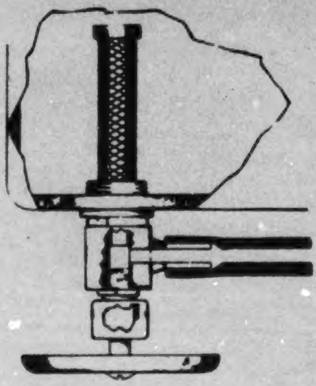
b. ____________________



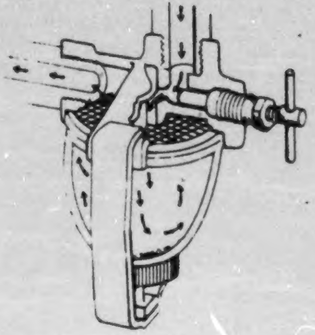
717

c. ____________________

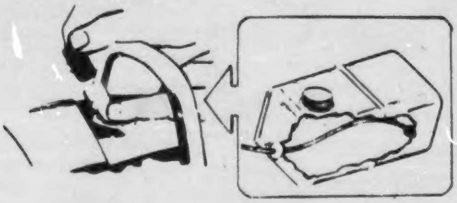
4. Identify the following types of fuel filters.



a.________________________________

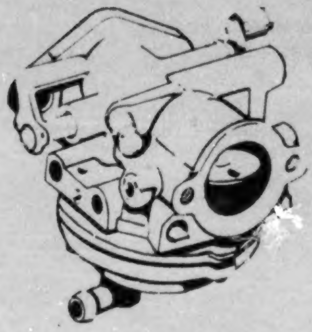


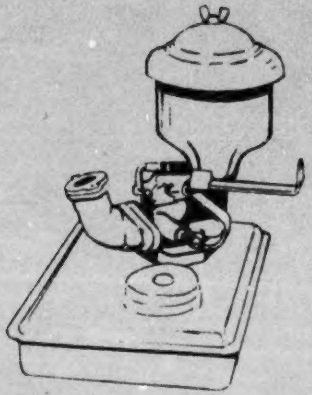
b.________________________________



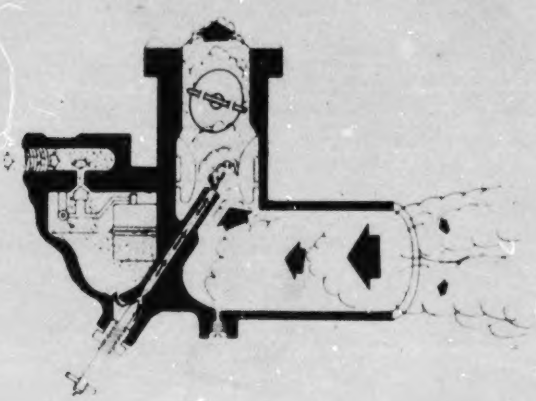
c.________________________________

5. Identify the following types of carburetors.



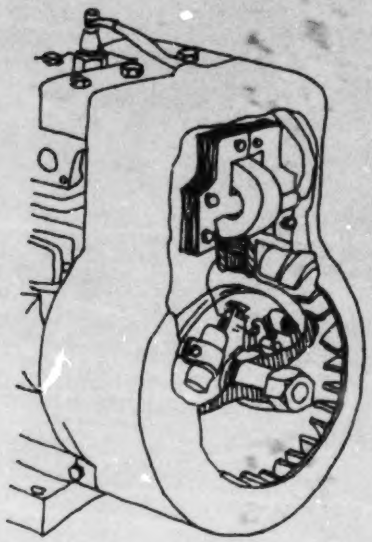


a. ______________________ b. ______________________

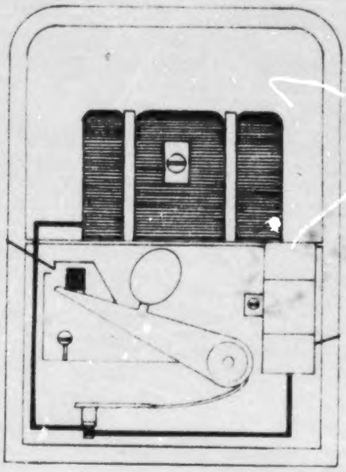


c. ______________________

6. Identify the following types of magnetos.



a. ______________________________



b. ______________________________

7. Demonstrate the ability to:

   a. Clean and inspect crankcase and accessories.

   b. Clean and inspect cooling system.

   c. Service oil-bath air cleaner.

   d. Service oiled-filter air cleaner.

   e. Service dry-filter air cleaner.

   f. Service sediment bowl fuel strainer.

   g. Service screen type fuel strainer.

   h. Service crankcase breather.

   i. Change crankcase oil.

   j. Check spark plug for proper operation.

   k. Clean and service spark plugs.

   l. Replace ignition contact points and condenser on internal magneto.

   m. Replace ignition contact points and condenser on external magneto.

   n. Service float type carburetor.

(NOTE: If the above activities have not been accomplished prior to the test, ask your instructor when they should be completed.)

SERVICING SMALL ENGINES
UNIT III

ANSWERS TO TEST

1. a. 4
   b. 6
   c. 5
   d. 8
   e. 3
   f. 9
   g. 2
   h. 7
   i. 1

2. Any four of the following:
   a. Commercial solvent called *degreaser*
   b. Petroleum solvents
      1) Kerosene
      2) Diesel fuel
   c. Live stem
   d. Detergent solvent (car wash)

3. a. Oil-bath
   b. Dry-filter
   c. Oiled-filter

4. a. Screen in fuel tank
   b. Combination screen and sediment bowl
   c. Strainer on fuel pick-up hose

5. a. Diaphragm
   b. Suction-lift
   c. Float

6. a. Internal (flywheel) magneto

   b. External magneto

7. Performance skills evaluated to the satisfaction of instructor

ELECTRICAL SAFETY
UNIT IV

UNIT OBJECTIVE

After completion of this unit, the student should be able to demonstrate safe practices in working with electricity to protect life and property. The student should be able to recognize danger areas when surveying the home farm. This knowledge will be evidenced by completion of assignment sheets and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with electrical safety to the correct definitions.
2. Name sources of electrical defects in equipment.
3. Name major causes of electrical accidents.
4. Discuss ways to free someone receiving electrical shock.
5. Arrange in order procedures to follow in giving first aid to a person who has just received electrical shock.
6. Discuss in a short paragraph factors contributing to death from electrical shock.
7. Identify types of circuit protection devices.
8. Select from a list signs that wiring is out-of-date.
9. Select from a list reasons for circuit failure.
10. Survey home farm for safe and unsafe electrical conditions.

ELECTRICAL SAFETY
UNIT IV

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

   A. Provide student with objective sheet.

   B. Provide student with information and assignment sheets.

   C. Make transparencies.

   D. Discuss unit and specific objectives.

   E. Discuss information and assignment sheets.

   F. Counsel with student about safe and unsafe working conditions of electricity.

   G. Obtain figures from National Safety Council, 444 N. Michigan Avenue, Chicago, Illinois 60617, on danger and damage caused by improperly using electricity and electrical equipment.

   H. Secure resource person to assist with first aid training.

   I. Give test.

II. Instructional materials:

   A. Objective sheet

   B. Information sheet

   C. Transparency masters

      1. TM 1--Safety Precautions

      2. TM 2--Safety Precautions (Continued)

      3. TM 3--Circuit Protection Devices

      4. TM 4--Circuit Protection Devices (Continued)

   D. Assignment Sheet #1--Survey Home Farm for Safe and Unsafe Electrical Conditions

   E. Test

   F. Answers to test

III. Unit references:

A. *Simplified Electric Wiring Handbook.* Chicago: Sears-Roebuck and Co.

B. Brown, Robert H. *Farm Electrification.* New York: McGraw-Hill Book Co., Inc.

C. Phipps, Lloyd J.; McColly, H. F.; Scranton, L. L.; and Cook, G.C. *Farm Mechanics Text and Handbook.* Danville, Illinois: The Interstate Printers and Publishers, Inc.

D. *Farm Electricity.* State of Tennessee, Department of Education, Division of Vocational Education.

E. *Basic Electricity and Practical Wiring Lessons.* University Park: Pennsylvania State University, College of Agriculture, Department of Agricultural Education.

F. Recht, J. L. *Accident Facts.* Chicago, Illinois: National Safety Council.

G. *National Electrical Code.* Boston, Massachusetts: National Fire Protection Association.

H. *Fundamentals of Service: Electrical Systems.* 2nd ed. Moline, Illinois: Deere and Co., 1972.

ELECTRICAL SAFETY
UNIT IV

INFORMATION SHEET

I. Terms and definitions

   A. Fuse--Safety device which breaks the flow of electrical current by burning out of a metal strip when a circuit becomes overloaded

   (NOTE: A fuse must be replaced when blown. Fuses are made of a bimetal strip which melts or breaks to break the circuit.)

   B. *National Electrical Code*--Handbook that sets minimum standards for wiring and materials

   C. Test lamp--Tool used to check short circuits, hot lines, and voltages

   D. Fusetron--Double element time delay fuse designed to withstand momentary overloads

   E. Grounded wire--Green or bare wire which serves as the third wire on 115-volt appliances to provide an easy path for electricity to flow from hot to ground in a shorted piece of equipment

   F. Circuit--Completed path through which electricity flows

   G. Circuit breaker--Safety device which breaks the flow of electrical current by tripping a breaker switch when a circuit becomes overloaded

   (NOTE: A circuit breaker may be reset. A circuit breaker contains a bimetal strip that overheats and trips the breaker.)

   H. Ground fault--Unintended voltage leak to the ground

   (NOTE: A ground fault interrupter should be installed to detect any unintended voltage leaks to the ground.)

II. Sources of electrical defects in equipment (Transparency 1)

   A. Ground wire missing, broken, improperly connected, or not connected at all

   (CAUTION: Never remove ground prong on equipment cords.)

   B. Open conduits; switch boxes damaged or worn

   C. Worn, wet, or oily insulation causing short circuits

   D. Defective switches, receptacles, extension or lamp cords, and lamp sockets

   (CAUTION: When handling lamp socket, keep bulb intact.)

INFORMATION SHEET

E. Dirty, improperly adjusted electrical equipment

F. Loose, vibrating machine parts which might cause a short circuit

G. Cracked insulation; bare or exposed wires

III. Major causes of electrical accidents

A. Carelessness

B. Misuse

C. Improper wiring

D. Lack of knowledge

E. Water

(CAUTION: Never handle electrical wires under wet conditions.)

IV. Ways to free someone receiving electrical shock (Transparency 2)

A. 120-240 volts

1. Locate line wire or source of electrical current and disconnect

(CAUTION: Do not take hold of the person's body with your bare hand.)

2. Decide immediately whether it would be easier to move the person or to move the conductor

(CAUTION: If conductor is to be moved, use some type of nonconductive material. If person's body is to be moved, use several thicknesses of paper or cloth as an insulator.)

3. Grasp person's arm or leg with paper or cloth in hand and quickly pull the person free of the conductor

B. Over 240 volts

1. Assume a downed wire is hot and can kill you

2. Protect the scene by posting a guard to keep passersby at least 200 feet away

3. Call power supplier immediately and give exact location of the trouble

INFORMATION SHEET

V. First aid for electrical shock

  A. Remove source of electricity

  B. Call doctor or ambulance immediately

  C. Check pulse and respiration

  (NOTE: If heart has stopped beating, heart massage is the only way to revive victim.)

  D. Treat with mouth-to-mouth resuscitation

  (CAUTION: Never pick up a downed line because it could be hot. If line is to be moved, use some type of nonconductive material. If person's body is to be moved, use several thicknesses of paper or cloth as an insulator.)

VI. Factors contributing to death from electrical shock

  A. Current (amperage) kills, not voltage

  B. Voltage is involved

  C. Less than 1/4 ampere will stop the heart

  (NOTE: Current flowing in a 25-watt lamp at 115 volts is enough to stop the heart of an average person.)

VII. Types of circuit protection devices (Transparencies 3 and 4)

  A. Fuses

    1. Blade

    2. Cartridge

    3. Plug

      a. Edison base

      b. Type S

    4. Accessory

    (NOTE: This fuse is mainly used in automotive and equipment circuits utilizing a battery as a primary source of power.)

  B. Circuit breakers

    1. Single pole

    2. Double pole

INFORMATION SHEET

VIII. Signs that wiring is out-of-date

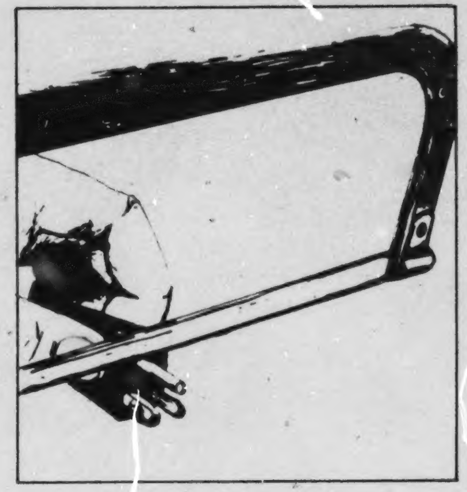
- A. Fuses blow
- B. Circuit breaker trips frequently
- C. Lights dim, blink, flicker
- D. Television picture wobbles
- E. Appliances need longer heating time
- F. Air conditioner fails to operate effectively
- G. Motors are slow to come up to normal speed
- H. Light bulbs burn out more quickly
- I. Television picture shrinks

IX. Reasons for circuit failure

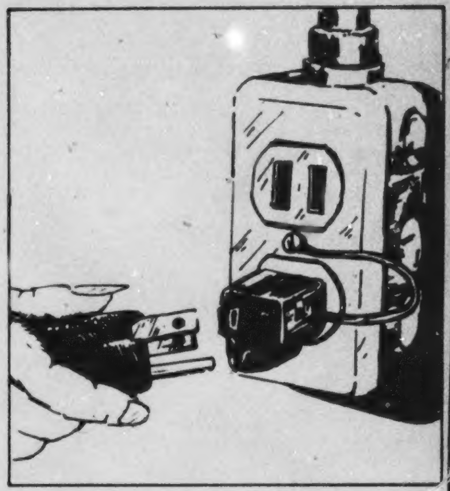
- A. Circuit overloaded
- B. Short circuit
- C. Wire broken
- D. Equipment defective

Safety Precautions

Modern homes have three-wire receptacles



Never cut off the third prong

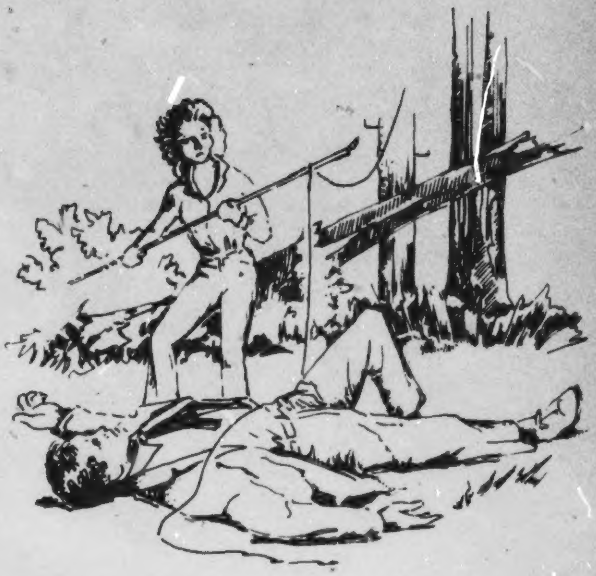


Use adaptor on old-type receptacle

Safety Precautions

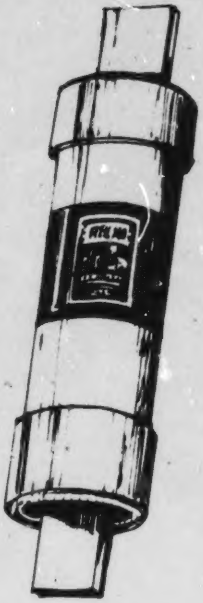
(Continued)

If a hot wire is in contact with a vehicle and the occupant must get out quickly, occupant should leap without touching the car again.

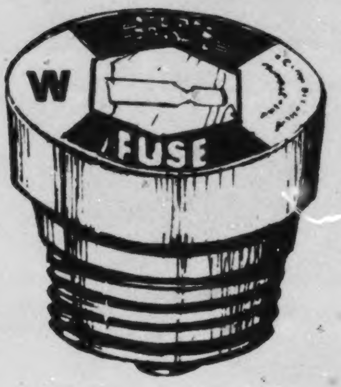


To remove a downed wire from a victim, use a nonconductor, such as a long, dry, wooden or plastic pole.

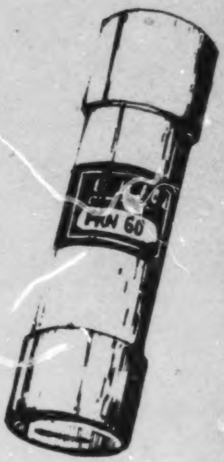
Circuit Protection Devices



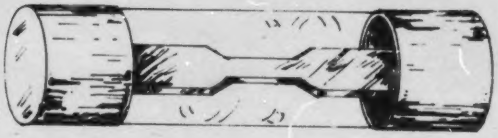
Blade Fuse



Edison Base Plug



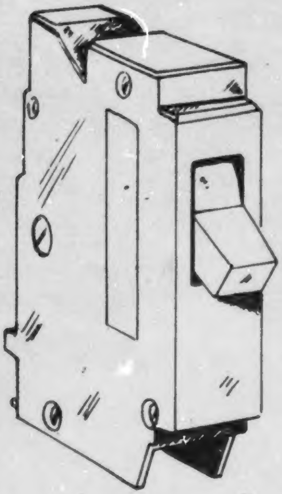
Cartridge Fuse



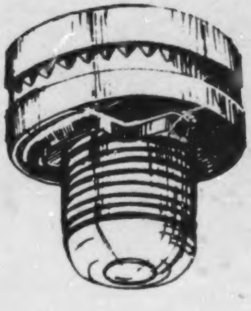
Accessory Fuse

Circuit Protection Devices

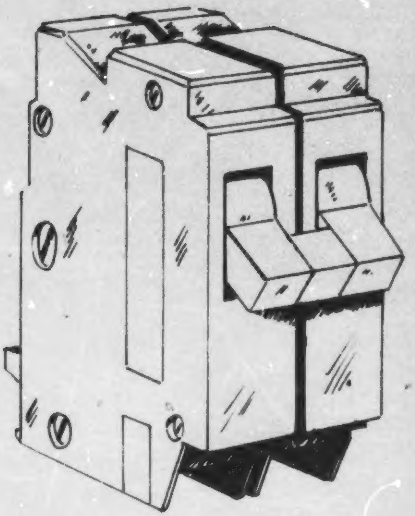
(Continued)



Single Pole Circuit Breaker



Type S Plug



Double Pole Circuit Breaker

ELECTRICAL SAFETY
UNIT IV

ASSIGNMENT SHEET #1--SURVEY HOME FARM FOR SAFE AND UNSAFE ELECTRICAL CONDITIONS

	HOUSE	YES	NO
1.	Are cords showing signs of wear?	____	____
2.	Is the lamp cord wrapped around bedstead or fastened to woodwork?	____	____
3.	Are the floor lamp cords worn?	____	____
4.	Are cords found under the rug?	____	____
5.	Are wires strung through doors?	____	____
6.	Are any wall receptacles broken?	____	____
7.	Are any wall receptacles without covers?	____	____
8.	Do fuses "blow" and breakers trip when appliances are connected?	____	____
9.	Does the cord on the washing machine show signs of wear?	____	____
10.	Are the motors of dryer and washing machine free of lint and oil?	____	____
11.	Have fuses or circuit breakers been tampered with, such as using pennies or other forms of dangerous substitutes?	____	____
12.	Is the panel switch door kept closed?	____	____
	SHOP AREA		
1.	Do all switch boxes and receptacles have covers?	____	____
2.	Does the equipment found in the shop have proper grounding devices attached?	____	____
3.	Are the extension cords in good working condition?	____	____
4.	Is the service entrance panel covered and free from dirt and lint?	____	____
5.	Are the welder leads in good working condition?	____	____

ASSIGNMENT SHEET #1

	YES	NO
6. Are any of the permanent equipment being operated with an extension cord?	_____	_____
7. Are electric motors protected from moisture, lint, and dirt?	_____	_____
8. Are overhead wires to outbuildings properly supported and high enough for proper clearance of vehicles passing under such wires? (NOTE: The clearance should be ten feet above walkways and eighteen feet above driveways.)	_____	_____
9. Are outbuildings properly grounded for lightning protection?	_____	_____

ELECTRICAL SAFETY
UNIT IV

TEST

NAME ______________________________ SCORE ______________

1. Match terms associated with electrical safety to the correct definitions.

_____a. Double element time delay fuse designed to withstand momentary overloads

_____b. Unintended voltage leak to the ground

_____c. Safety device which breaks the flow of electrical current by burning out of a metal strip when a circuit becomes overloaded

_____d. Green or bare wire which serves as the third wire on 115-volt appliances to provide an easy path for electricity to flow from hot to ground in a shorted piece of equipment

_____e. Handbook that sets minimum standards for wiring and materials

_____f. Completed path through which electricity flows

_____g. Tool used to check short circuits, hot lines, and voltages

_____h. Safety device which breaks the flow of electrical current by tripping a breaker switch when a circuit becomes overloaded

1. Fuse
2. *National Electrical Code*
3. Test lamp
4. Fusetron
5. Grounded wire
6. Circuit
7. Circuit breaker
8. Ground fault

2. Name five sources of electrical defects in equipment.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

3. Name two major causes of electrical accidents.

   a. ______________________________

   b. ______________________________

4. Discuss ways to free someone receiving electrical shock.

   a. 120-240 volts

   ____

   ____

   ____

   ____

   b. Over 240 volts

   ____

   ____

   ____

   ____

5. Arrange in order the procedures to follow when providing first aid to a person who has just received an electrical shock. Place numbers 1 through 4 in appropriate blanks.

   _____a. Call doctor or ambulance

   _____b. Remove source of electricity

   _____c. Treat with mouth-to-mouth resuscitation

   _____d. Check pulse and respiration

6. Discuss in a short paragraph factors contributing to death from electrical shock.

   ____

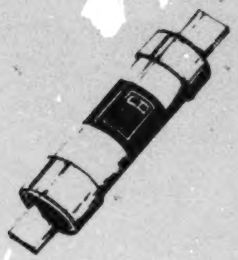
   ____

   ____

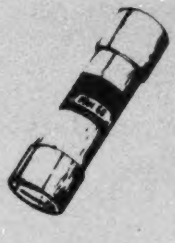
   ____

   ____

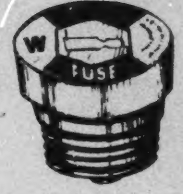
7. Identify the following types of circuit protection devices.



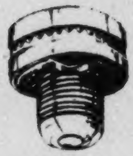
a. ________________



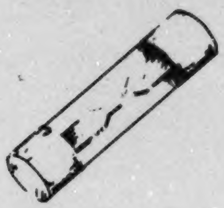
b. ________________



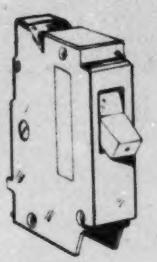
c. ________________



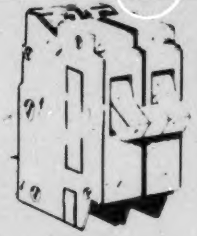
d. ________________



e. ________________



f. ________________



g. ________________

8. Select from the list below signs that wiring is out-of-date. Place an "X" in the appropriate blanks.

_____a. Motors are slow to come up to normal speed

_____b. Fuses blow

_____c. Lights dim, blink, flicker

_____d. Wires not in conduit

_____e. Television picture wobbles

_____f. Television picture shrinks

_____g. Light bulbs burn out more quickly

_____h. Air conditioner fails to operate effectively

9. Select from the list below reasons for circuit failure. Place an "X" in the appropriate blanks.

    ______a. Circuit overloaded

    ______b. Wire broken

    ______c. Equipment defective

    ______d. Wrong color of wire

    ______e. Too many circuits

    ______f. Short circuit

10. Survey home farm for safe and unsafe electrical conditions.

    (NOTE: If this activity has not been accomplished prior to the test, ask the instructor when it should be completed.)

ELECTRICAL SAFETY
UNIT IV

ANSWERS TO TEST

1. a. 4
   b. 8
   c. 1
   d. 5
   e. 2
   f. 6
   g. 3
   h. 7

2. Any five of the following:
   a. Ground wire missing, broken, improperly connected, or not connected at all
   b. Open conduits; switch boxes damaged or worn
   c. Worn, wet, or oily insulation causing short circuits
   d. Defective switches, receptacles, extension or lamp cords, and sockets
   e. Dirty, improperly adjusted electrical equipment
   f. Loose, vibrating machine parts which might cause a short circuit
   g. Cracked insulation; bare or exposed wires

3. Any two of the following:
   a. Carelessness
   b. Misuse
   c. Improper wiring
   d. Lack of knowledge
   e. Water

4. a. 120-240 volts
    1) Locate line wire or source of electrical current and disconnect
    2) Decide immediately whether it would be easier to move person or move conductor
    3) Grasp person's arm or leg with paper or cloth in hand and quickly pull person free of the conductor
  b. Over 240 volts
    1) Assume a downed wire is hot and can kill you
    2) Protect the scene by posting a guard to keep passersby at least 200 feet away
    3) Call power supplier immediately and give exact location of trouble

5. a. 2
  b. 1
  c. 4
  d. 3

6. Discussion should include:
  a. Current (amperage) kills, not voltage
  b. Voltage is involved
  c. Less than 1/4 ampere will stop the heart

7. a. Blade fuse
  b. Cartridge fuse
  c. Edison base plug
  d. Type S plug
  e. Accessory fuse
  f. Single pole circuit breaker
  g. Double pole circuit breaker

8. a, b, c, e, f, g, h

9. a, b, c, f

10. Evaluated to satisfaction of instructor

FUNDAMENTALS OF ELECTRICITY
UNIT V

UNIT OBJECTIVE

After completion of this unit, the student should be able to calculate the cost of operating electrical equipment and solve problems related to voltage, amperage, resistance, and wattage. The student should demonstrate the ability to use a voltmeter. This knowledge will be evidenced by completion of assignment sheets, job sheets, and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with fundamentals of electricity to the correct definitions.
2. Distinguish between single-phase and three-phase power.
3. Match the means of transporting electricity to the correct descriptions.
4. Name the types of power suppliers.
5. Match letter designations used in Ohm's law to the correct terms.
6. State Ohm's law as related to electricity.
7. Calculate problems using Ohm's law as related to power.
8. Calculate the cost of operating electrical equipment.
9. Solve problems to determine voltage.
10. Solve problems to determine amperage.
11. Solve problems to determine resistance and wattage.
12. Demonstrate the ability to use a voltmeter.

FUNDAMENTALS OF ELECTRICITY
UNIT V

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

   A. Provide student with objective sheet.

   B. Provide student with information, assignment, and job sheets.

   C. Make transparencies.

   D. Discuss unit and specific objectives.

   E. Discuss information and assignment sheets.

   F. Show film.

   G. Take field trip to visit and determine how electrical power is transported.

   H. Invite a resource person from your electric cooperative to discuss with class how the cooperative operates.

   I. Demonstrate and discuss procedures outlined on job sheet.

   J. Give test.

II. Instructional materials:

   A. Objective sheet

   B. Information sheet

   C. Transparency masters

      1. TM 1--Electrical Transporting Lines

      2. TM 2--Ohm's Law

      3. TM 3--Ohm's Law Formulas as Related to Power

   D. Assignment sheets

      1. Assignment Sheet #1--Calculate Cost of Operating Electrical Equipment

      2. Assignment Sheet #2--Solve Problems to Determine Voltage

      3. Assignment Sheet #3--Solve Problems to Determine Amperage

      4. Assignment Sheet #4--Solve Problems to Determine Resistance and Wattage

E. Answers to assignment sheets

F. Job Sheet #1--Use a Voltmeter

G. Test

H. Answers to test

III. Unit references:

A. Brown, Robert H. *Farm Electrification.* New York: McGraw-Hill Book Co., Inc.

B. Phipps, Lloyd J.; McColly, H. F.; Scranton, L. L.; and Cook, G. C. *Farm Mechanics Text and Handbook.* Danville, Illinois: The Interstate Printers and Publishers, Inc.

C. *Farm Electricity.* State of Tennessee, Department of Education, Division of Vocational Education.

D. *Basic Electricity and Practical Wiring Lessons.* University Park: Pennsylvania State University, College of Agriculture, Department of Agricultural Education.

E. Wantiez, Gary W. *Air Conditioning and Refrigeration: Book Two.* Stillwater, Oklahoma: Mid-America Vocational Curriculum Consortium, 1977.

F. Whirlpool Tech-Care Home Products Service. *Basic Electricity for Appliances.* 2nd ed. Indianapolis: Howard W. Sams and Co., 1975.

G. Carrier Air Conditioning Company. *Applied Electricity: Air Conditioning (Electric Meters).* Carrier Corp., 1965.

H. Smith, Earle L. *Power Line Technician's Training.* Stillwater, Oklahoma: Oklahoma State Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, 1978.

I. Turner, J. Howard. *Understanding Electricity and Electrical Terms.* Athens, Georgia: American Association for Vocational Instructional Materials, 1974.

IV. Film--"Electricity for Beginners." Available from Coronet Films, 65 East South Water Street, Chicage, Illinois 60601.

(NOTE: Oklahoma teachers may order the film from the Curriculum and Instructional Materials Center, 1515 West Sixth, Stillwater, Oklahoma 74074.)

FUNDAMENTALS OF ELECTRICITY
UNIT V

INFORMATION SHEET

I. Terms and definitions

A. Electricity--Source of energy that can be easily converted into light, heat, or power

B. Ampere--Unit of measure of the rate of flow of electricity through a wire

C. Volt--Unit of measure of electrical pressure

D. Watt--Unit of measure used in determining the rate of energy supplied

E. Watt-hour--One watt for one hour

F. Kilowatt (kW)--1000 watts

G. Kilowatt-hour (kW·h)--Reference indicating the use of 1,000 watts of electricity for one hour

H. Horsepower (hp)--Unit of mechanical power which is equal to 746 watts of electrical power

(NOTE: Due to operational inefficiency and bearing drag, this wattage figure cannot be used to determine a motor's horsepower rating.)

I. Direct current (DC)--Current flows in one direction at a continuous rate

J. Alternating current (AC)--Current reverses at regular intervals

K. Circuit--Complete path through which electricity flows, such as from the power source to a lamp, through the lamp, and back to the power source

L. Switch--Device used to open or close circuit

M. Fuse--Safety device which opens the circuit when current becomes too great

(NOTE: A fuse must be replaced when open.)

N. Circuit breaker--Safety device which opens the circuit by tripping a switch rather than burning

(NOTE: A circuit breaker can be reset after time is allowed for cooling.)

O. Conductors--Wires which carry the electricity; wires through which electricity flows

INFORMATION SHEET

P. Insulation--Nonconductive protective covering over wires to prevent completing a circuit except where desired

Q. Hot wire--Current-carrying conductor with electrical pressure on it (usually black or red); connected to fuse or circuit breaker at distribution panel, subpanel, or fusable disconnect

R. Neutral wire--Intentionally grounded current-carrying conductor with no pressure on it (usually white); connected to neutral base at the distribution panel

S. Grounding--Connection of the neutral part of the electrical system to the earth to reduce the possibility of damage from lightning; connection of the housings of electrical equipment to the earth to minimize the danger of electrical shock

T. Short circuit--Improper connection between hot and neutral wires or between hot wires

U. Voltage drop--Loss in electrical pressure from its source to its point of use

(NOTE: This may be caused by size of wire, type of wire, and distance.)

V. UL (Underwriter's Laboratories)--Nationally accepted organization which tests all types of wiring materials and devices to make certain that they meet predetermined standards for safety and quality

W. Meter--Instrument which records the amount of electrical energy used (kilowatt-hours)

X. Resistance--Property of a substance that opposes the flow of current

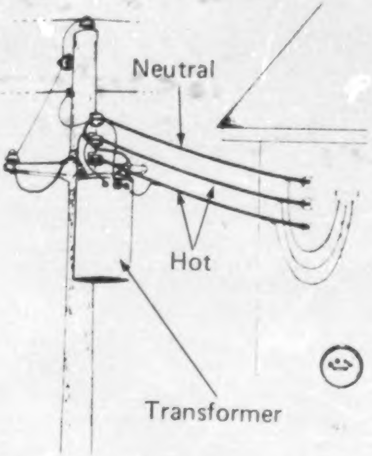
II. Types of power

A. Single-phase

1. Three wires--Two hot delivery and one neutral
2. 120-240 volts or 115-230 volts

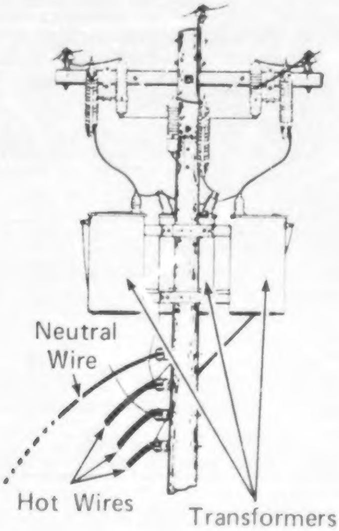
INFORMATION SHEET

3. One transformer



B. Three-phase

1. Four wires--Three hot delivery and one neutral
2. 120-240 volts or 115-230 volts
3. Two or three transformers



(NOTE: Compare one person driving a stake to three persons driving the same stake. The three individuals can deliver three times as many blows as the one person can. The same holds true with three-phase electricity. It is used when large quantities of electrical power are needed. Most homes and farms are supplied with single-phase power.)

INFORMATION SHEET

III. Means of transporting electricity (Transparency 1)

A. Transmission line--Line that extends from generating station to substation or from substation to substation

(NOTE: Transmission lines generally carry 30,000 to 130,000 volts.)

Example: Steel towers or double poles

B. Distribution line--Line beginning at a substation and extending out over the countryside, usually ranging from three to fifteen miles

(NOTE: Distribution lines generally carry 7,200 to 13,000 volts.)

C. Service drop line--Line that runs from a distribution line to the meter pole

D. Feeder line--Line that runs from the meter pole to the house

IV. Types of power suppliers

A. REA cooperatives

B. Public or private companies

V. Letter designations used in Ohm's law (Transparency 2)

A. Voltage = E (electromotive force measured in volts)

B. Current = I (intensity in amperes)

C. Resistance = R (resistance in ohms)

D. Wattage = P (power in watts)

VI. Ohm's law--Current (intensity in amperes) in an electric circuit equals the pressure (volts) divided by the resistance (amperes) (Transparency 2)

VII. Calculating problems using Ohm's law as related to power (Transparency 3)

A. To find wattage when amperage and voltage are known

Watts = Amperes x Volts

Example: P = I x E

P = 0.5 amperes x 24 volts

P = 12 watts

INFORMATION SHEET

B. To find amperage when wattage and voltage are known

Amperes = Watts ÷ Volts

Example: $I = P \div E$

$I = 690 \text{ watts} \div 115 \text{ volts}$

$I = 6 \text{ amperes}$

C. To find voltage when wattage and amperage are known

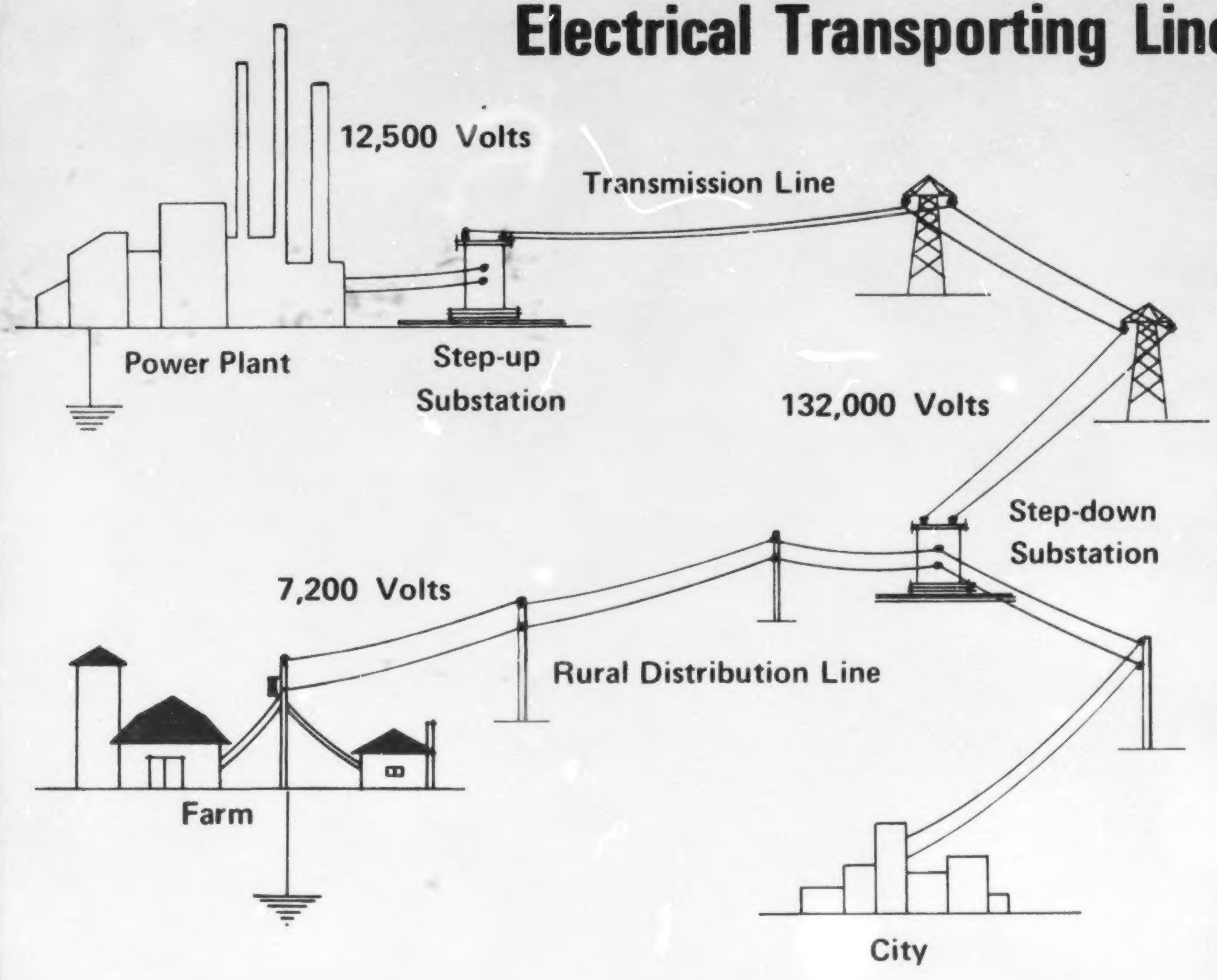
Volts = Watts ÷ Amperes

Example: $E = P \div I$

$E = 500 \text{ watts} \div 4 \text{ amperes}$

$E = 125 \text{ volts}$

Electrical Transporting Lines



Ohm's Law

$I = \frac{E}{R}$

$$\text{Amperes} = \frac{\text{Volts}}{\text{Ohms}}$$

$E = IR$

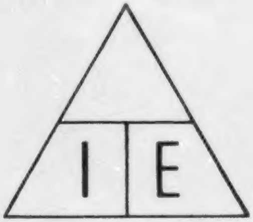
$$\text{Volts} = \text{Amperes} \times \text{Ohms}$$

$R = \frac{E}{I}$

$$\text{Ohms} = \frac{\text{Volts}}{\text{Amperes}}$$

Ohm's Law Formulas as Related to Power

P =

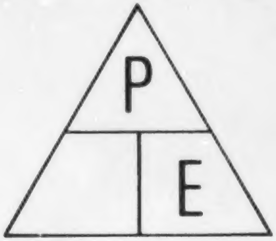


or

P = I × E or

Watts = Amperes × Volts

I =

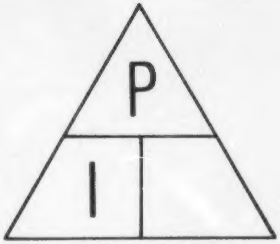


or

I =P/E or

Amperes = Watts ÷ Volts

E =



or

E = P/I or

Volts = Watts ÷ Amperes

FUNDAMENTALS OF ELECTRICITY
UNIT V

ASSIGNMENT SHEET #1--CALCULATE COST OF OPERATING ELECTRICAL EQUIPMENT

Work each of the problems listed below by using the information provided. All problems should be worked using the average cost of 2¢ per kW·h for electricity. Be sure to show your work.

Watts x Hours of Operation = Watt-hours

Kilowatt-hours (kW·h) = $\frac{\text{Watts x Hours}}{1000}$

Multiply 1,200 by hp rating if motor is smaller than one-half hp

Multiply 1,000 by hp rating if motor is one-half hp or greater

Example: 1/4 hp motor x 1,200 = 300 watts

300 watts x 2 hours of operation = 600 watt-hours

$\frac{600}{1000}$ = 0.6 kW·h

0.6 x 2¢ = 1.2¢

1. How much would it cost to operate a 1/4 hp motor for 12 hours?

2. How much would it cost to operate a 2 hp motor for 10 hours?

3. How much would it cost to operate a 100 watt light bulb for a period of 12 hours?

ASSIGNMENT SHEET #1

4. An electric refrigerator requires 150 watts of electric power. It operates an average of four hours each day. How many kilowatt-hours would be used in 30 days, and how much would it cost for operation?

5. What would be the cost of operating a heat lamp that pulls 200 watts for 5 hours?

FUNDAMENTALS OF ELECTRICITY
UNIT V

ASSIGNMENT SHEET #2--SOLVE PROBLEMS TO DETERMINE VOLTAGE

Apply the appropriate formula from Ohm's law to find the voltage.

Example 1: 2 amperes, 60 ohms = _____ volts

Amperes x Ohms = Volts
2 x 60 = 120

Example 2: 2 amperes, 240 watts = _____ volts

Watts ÷ Amperes = Volts
240 ÷ 2 = 120

PROBLEMS

	Amperes	Ohms		Volts
1.	20	6	=	_____
2.	4	60	=	_____
3.	9.6	2.5	=	_____
4.	5	2.4	=	_____
	Amperes	Watts		
5.	6	1380	=	_____
6.	6.5	715	=	_____
7.	2.5	1000	=	_____
8.	5	600	=	_____
9.	7	805	=	_____
10.	4	500	=	_____

FUNDAMENTALS OF ELECTRICITY
UNIT V

ASSIGNMENT SHEET #3--SOLVE PROBLEMS TO DETERMINE AMPERAGE

Apply the appropriate formula to find the amperage.

Example 1: 120 volts, 40 ohms = ____________ amperes

Volts ÷ Ohms = Amperes
120 ÷ 40 = 3

Example 2: 120 watts, 120 volts = ____________ amperes

Watts ÷ Volts = Amperes
120 ÷ 120 = 1

PROBLEMS

	Volts	Ohms		Amperes
1.	230	12	=	
2.	110	11	=	
3.	440	20	=	
4.	120	40	=	
5.	24	3	=	
	Watts	Volts		Amperes
6.	6,000	120	=	
7.	2,640	240	=	
8.	8,800	440	=	
9.	690	115	=	
10.	2,760	230	=	

FUNDAMENTALS OF ELECTRICITY
UNIT V

ASSIGNMENT SHEET #4--SOLVE PROBLEMS TO DETERMINE RESISTANCES AND WATTAGES

Apply the appropriate formula to solve the problems below.

Example 1: 440 volts, 10 amperes = ____________ ohms

Volts ÷ Amperes = Ohms
440 ÷ 10 = 44

Example 2: 115 volts, 12 amperes = ____________ watts

Volts x Amperes = Watts
115 x 12 = 1380

PROBLEMS

	Volts	Amperes	Ohms
1.	240	4	
2.	24	9.6	
3.	12	5	
4.	230	17.5	
5.	24	8	

	Volts	Amperes	Watts
6.	240	11	
7.	115	6	
8.	440	20	
9.	230	50	
10.	24	0.5	

FUNDAMENTALS OF ELECTRICITY
UNIT V

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1

1. 7.2¢
2. 40¢
3. 2.4¢
4. 18 kW·h, 36¢
5. 2¢

Assignment Sheet #2

1. 120
2. 240
3. 24
4. 12
5. 230
6. 110
7. 400
8. 120
9. 115
10. 125

Assignment Sheet #3

1. 19.17
2. 10
3. 22
4. 3
5. 8
6. 50
7. 11
8. 20
9. 6
10. 12

Assignment Sheet #4

1. 60
2. 2.5
3. 2.4
4. 13.1
5. 3
6. 2640
7. 690
8. 8800
9. 11500
10. 12

FUNDAMENTALS OF ELECTRICITY
UNIT V

JOB SHEET #1--USE A VOLTMETER

I. Tools and materials

   A. Voltmeter

   B. Safety glasses

   C. 120 VAC wall outlet

   D. 240 VAC wall outlet

   E. 240 VAC one-phase disconnect

   F. Three-phase disconnect

   (NOTE: All of these materials should be connected to the proper voltage.)

II. Procedure

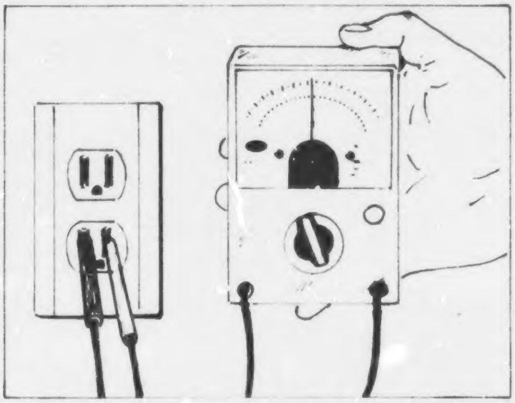
   (NOTE: Use this only if instruction has been provided.)

   A. Put on safety glasses

   B. Select highest A.C. scale

   C. Check across a 120 VAC wall outlet (Figure 1)

FIGURE 1

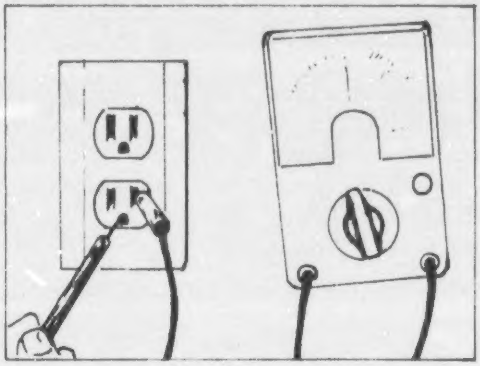


JOB SHEET #1

D. Select meter scale that will allow for the most accurate reading

E. Check from each side to ground (Figure 2)

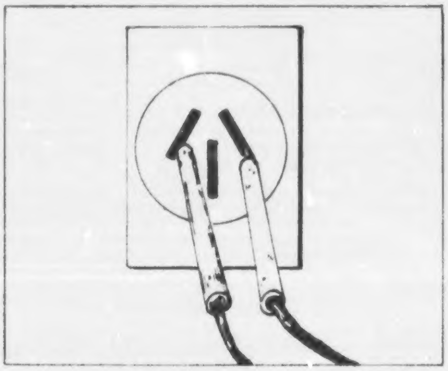
FIGURE 2



F. Switch to highest A.C. scale

G. Check across a 240 VAC wall outlet (Figure 3)

FIGURE 3

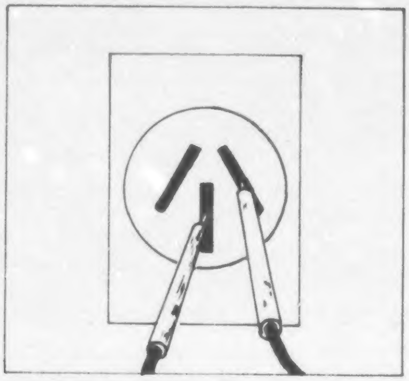


H. Select meter scale that will allow for the most accurate reading

JOB SHEET #1

I. Check from each side to ground (Figure 4)

FIGURE 4



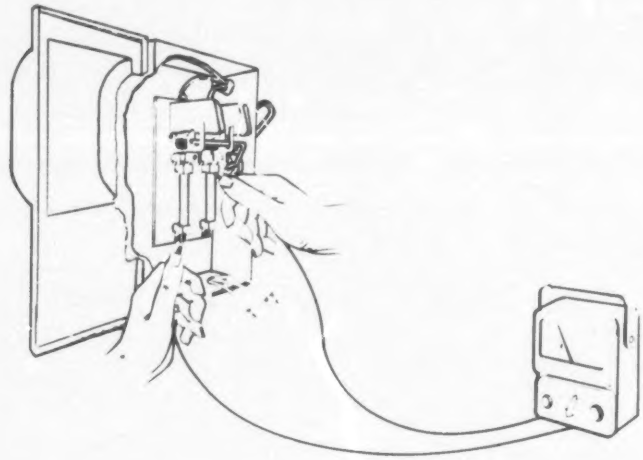
J. Switch to highest A.C. scale

K. Check line side of disconnect

L. Select meter scale that will allow for the most accurate reading

M. Check load side of disconnect (Figure 5)

FIGURE 5



N. Repeat steps J through M and check a three-phase disconnect

O. Put away voltmeter

(NOTE: Have instructor observe your work.)

FUNDAMENTALS OF ELECTRICITY
UNIT V

TEST

NAME ______________________________ SCORE ____________________

1. Match the terms on the right to the correct definitions on the left by placing the appropriate numbers in the blanks provided.

_____a. Unit of measure of the rate of flow of electricity through a wire

_____b. One watt for one hour

_____c. Reference indicating the use of 1,000 watts of electricity for one hour

_____d. Unit of measure of electrical pressure

_____e. Source of energy that can be easily converted into light, heat, or power

_____f. Unit of measure used in determining the rate of energy supplied

_____g. Unit of mechanical power which is equal to 746 watts of electrical power

_____h. Safety device which opens the circuit by tripping a switch rather than burning

_____i. Current flows in one direction at a continuous rate

_____j. Current reverses at regular intervals

_____k. Safety device which opens the circuit when current becomes too great

_____l. Complete path through which electricity flows, such as from the power source to a lamp, through the lamp, and back to the power source

1. Electricity
2. Ampere
3. Volt
4. Watt
5. Watt-hour
6. Kilowatt-hour (kW·h)
7. Horsepower (hp)
8. Direct current (DC)
9. Alternating current (AC)
10. Circuit
11. Circuit breaker
12. Fuse

______m. Device used to open or close circuit

______n. Loss in electrical pressure from its source to its point of use

______o. Property of a substance that opposes the flow of current

______p. Nationally accepted organization which tests all types of wiring materials and devices to make certain that they meet predetermined standards for safety and quality

______q. Improper connection between hot and neutral wires or between hot wires

______r. Connection of the neutral part of the electrical system to the earth to reduce the possibility of damage from lightning; connection of the housings of electrical equipment to the earth to minimize the danger of electrical shock

______s. Wire which carries the electricity; wire through which electricity flows

______t. Intentionally grounded current-carrying conductor with no pressure on it (usually white); connected to neutral base at the distribution panel

______u. Nonconductive protective covering over wires to prevent completing a circuit except where desired

______v. Instrument which records the amount of electrical energy used (kilowatt-hours)

______w. Current-carrying conductor with electrical pressure on it (usually black or red); connected to fuse or circuit breaker at distribution panel, subpanel, or fusable disconnect

______x. 1000 watts

13. Switch
14. Conductor
15. Resistance
16. Neutral wire
17. Grounding
18. Short circuit
19. Voltage drop
20. UL (Underwriter's Laboratories)
21. Insulation
22. Hot wire
23. Meter
24. Kilowatt (kW)

2. Distinguish between single-phase and three-phase power by placing an "X" in the blank indicating three-phase power.

______a. Four wires (three hot delivery and one neutral); 120-240 volts or 115-230 volts; two or three transformers

______b. Three wires (two hot delivery and one neutral); 120-240 volts or 115-230 volts; one transformer

3. Match the means of transporting electricity to the correct descriptions.

______a. Line that extends from generating station to substation or from substation to substation

______b. Line beginning at a substation and extending out over the countryside, usually ranging from three to fifteen miles

______c. Line that runs from a distribution line to the meter pole

______d. Line that runs from the meter pole to the house

1. Distribution line
2. Transmission line
3. Feeder line
4. Service drop line

4. Name the types of power suppliers.

a. ____

b. ____

5. Match letter designations used in Ohm's law to the correct terms.

______a. Current

______b. Voltage

______c. Resistance

1. I
2. R
3. E

6. State Ohm's law as related to electricity.

____

____

7. Calculate problems using Ohm's law as related to power.

a. 1,250 watts ÷ 6 amperes = ___________volts

b. 400 watts ÷ 120 volts = ___________amperes

c. 120 volts x 4 amperes = ___________watts

8. Calculate the cost of operating electrical equipment.
9. Solve problems to determine voltage.
10. Solve problems to determine amperage.
11. Solve problems to determine resistance and wattage.
12. Demonstrate the ability to use a voltmeter.

(NOTE: If activities 8-12 have not been accomplished prior to the test, ask your instructor when they should be completed.)

FUNDAMENTALS OF ELECTRICITY
UNIT V

ANSWERS TO TEST

1. a. 2
   b. 5
   c. 6
   d. 3
   e. 1
   f. 4
   g. 7
   h. 11
   i. 8
   j. 9
   k. 12
   l. 10
   m. 13
   n. 19
   o. 15
   p. 20
   q. 18
   r. 17
   s. 14
   t. 16
   u. 21
   v. 23
   w. 22
   x. 24

2. a

3. a. 2
   b. 1
   c. 4
   d. 3

4. a. REA cooperatives
   b. Public or private companies

5. a. 1
   b. 3
   c. 2

6. Current (intensity in amperes) in an electric circuit equals the pressure (volts) divided by the resistance (amperes)

7. a. 208.33 volts
   b. 3.33 amperes
   c. 480 watts

8. Evaluated to satisfaction of instructor

9. Evaluated to satisfaction of instructor
10. Evaluated to satisfaction of instructor
11. Evaluated to satisfaction of instructor
12. Performance skills evaluated to satisfaction of instructor

ELECTRICAL WIRING PRACTICES
UNIT VI

UNIT OBJECTIVE

After completion of this unit, the student should be able to identify electrical tools and devices. The student should be able to complete a chart on conductors, types, and uses and match electrical schematic symbols to their names. The student should be able to demonstrate the ability to wire receptacles and lighting outlets. This knowledge will be evidenced by completion of the job sheets and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with electrical wiring to the correct definitions.
2. Identify tools used in electrical wiring.
3. Identify electrical devices.
4. Complete a chart on conductors, types, and uses.
5. Name factors affecting voltage drop.
6. Arrange in order the procedure to follow in wiring.
7. Match electrical schematic symbols to their names.
8. Distinguish between schematic diagrams and wiring diagrams.
9. Demonstrate the ability to:
    a. Repair an extension cord plug.
    b. Wire a lighting outlet controlled by a single pole switch with a duplex receptacle.
    c. Wire three duplex receptacles using nonmetallic cable.
    d. Wire lighting outlet controlled by two three-way switches.
    e. Wire a range plug.

ELECTRICAL WIRING PRACTICES
UNIT VI

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

  A. Provide student with objective sheet.

  B. Provide student with information sheet.

  C. Make transparencies.

  D. Discuss unit and specific objectives.

  E. Discuss information sheet.

  F. Demonstrate and discuss procedures outlined on the job sheets.

  G. Collect samples of devices and conductors for class use.

  H. Give test.

II. Instructional materials:

  A. Objective sheet

  B. Information sheet

  C. Transparency masters

    1. TM 1--Electrical Wiring Tools

    2. TM 2--Electrical Wiring Tools (Continued)

  D. Job sheets

    1. Job Sheet #1--Repair an Extension Cord Plug

    2. Job Sheet #2--Wire a Lighting Outlet Controlled by a Single-Pole Switch with a Duplex Receptacle

    3. Job Sheet #3--Wire Three Duplex Receptacles Using Nonmetallic Cable

    4. Job Sheet #4--Wire Lighting Outlet Controlled by Two Three-way Switches

    5. Job Sheet #5--Wire a Range Plug

  E. Test

  F. Answers to test

III. Unit references:

A. Brown, Robert H. *Farm Electrification.* New York: McGraw-Hill Book Co., Inc.

B. Phipps, Lloyd J.; McColly, H. F.; Scranton, L. L.; and Cook, G. C. *Farm Mechanics Text and Handbook.* Danville, Illinois: The Interstate Printers and Publishers, Inc.

C. *Farm Electricity.* State of Tennessee, Department of Education, Division of Vocational Education.

D. *Basic Electricity and Practical Wiring Lessons.* University Park: Pennsylvania State University, College of Agriculture, Department of Agricultural Education.

ELECTRICAL WIRING PRACTICES
UNIT VI

INFORMATION SHEET

I. Terms and definitions

   A. Conductors--Wires, cords, or cables which carry the electricity or through which electricity flows

   B. Cable--Two or more conductors grouped together inside an overall covering

   C. Cord--Two or more stranded conductors grouped together in a flexible covering

   D. Wire--Single conductor which carries electricity

      (NOTE: This is usually a solid wire.)

   E. Terminal--Device attached to the end of a wire or cable or to an electrical apparatus for convenience in making connections

   F. Schematic diagram--Line-type illustration using standardized symbols to represent an electrical circuit

   G. Wiring diagram--Plan which shows the electric circuit with items arranged and appearing so the job of connecting will be simplified

   H. Junction box--Outlet box with a blank cover used to contain splices of a circuit

   I. Outlet box--Box-like device which is used to bring the wires to the location where a switch or outlet is installed; handy box

   J. Receptacle outlet--Device which contains the splices when a circuit is tapped for an appliance or a light

   K. Conduit--Thin-walled steel pipe used to protect electrical wires

   L. Single pole toggle switch--Switch used to break the current in a single place

   M. Three-way switch--Switch used to control lights and motors from two different places

   N. Four-way switch--Switch used to control lights and motors from three or more different places

   O. Wire gauge--Tool used to measure wire diameter

   P. Wire size--Measure of wire diameter

   Q. Polarized--Having slots or contact blades paired so as not to allow for a different contact arrangement

INFORMATION SHEET

II. Electrical wiring tools (Transparencies 1 and 2)

   A. Needle nose pliers

   B. Line technician's pliers

   C. Diagonal pliers

   D. Wire cutter or stripper

   E. Standard screwdriver

   F. Phillips screwdriver

   G. Pocket knife

   H. Hammer

   I. Wood chisel

   J. Electric drill

   K. Tape or rule

   L. Keyhole saw

   M. Hacksaw

   N. Test light

   O. Volt-ammeter

   P. Vise-grip pliers

   Q. Fish tape and reel

   R. Conduit bender

III. Electrical devices

   A. Edison base plug fuse

   (NOTE: These can be either single element or dual element time delay fuses.)

INFORMATION SHEET

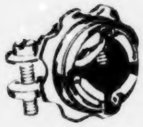
B. Cartridge fuse

(NOTE: These can be single element, dual element time delay, or of special design classification for specific installations.)

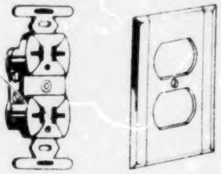
C. Heavy duty plug

D. Fuse box cover with grounded outlet for fractional horsepower motor protection

E. Connector



F. Duplex grounding receptacle and cover

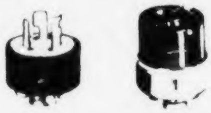


INFORMATION SHEET

G. Surface mount range receptacle

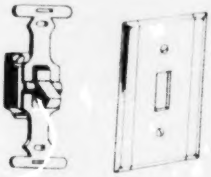
H. Surface mount duplex grounding receptacle

I. Three wire twist lock connector and plug



J. Toggle switch and cover

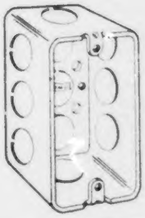
(NOTE: This can be single pole, three-way, or double pole.)



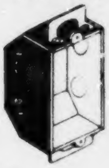
K. Crow foot plug and connector

INFORMATION SHEET

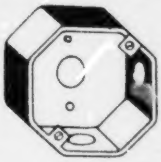
L. Handy box



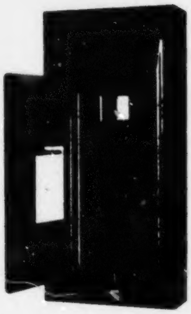
M. Beveled corner wall box with plaster ears



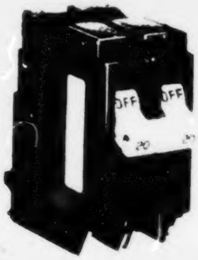
N. Octagon box



O. Distribution panel

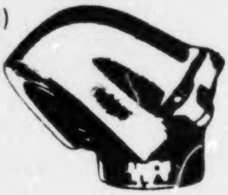


P. 240-volt breaker

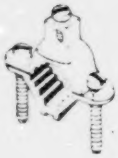


INFORMATION SHEET

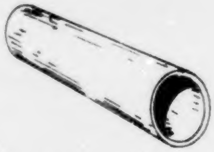
Q. Service entrance cap (weather head)



R. Ground clamp

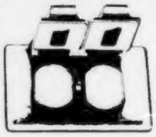


S Rigid steel conduit



T. Flexible steel conduit

U. Weatherproof wall plate



INFORMATION SHEET

IV. Conductors, types, and uses

ITEM	TYPE	USE
Wire	A	Heating appliances within apparatus, dry locations
Wire	TW	Inside of conduit, dry and wet locations
Wire	USE	Trench, underground
Wire	TW (Low Voltage)	Low voltage alarm or relay controls
Cord	HPN	Heater cord
Cord	S	Hard usage, welders, large motors
Cord	HC	Iron, heaters
Cord	SJ	Portable tools
Cord	SV	Vacuum cleaners, mixers
Cable	Triplex	Outside, overhead service
Cable	UF	Underground, feeder and branch circuits
Cable	NM	Inside, dry locations

(NOTE: Wire, cord, and cable come in various sizes according to specific application. Size is generally indicated on the insulation cover.)

V. Factors affecting voltage drop

- A. Length of wire
- B. Size of wire
- C. Number of amps flowing through wire
- D. Type of conductor

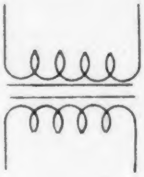
VI. Procedure to follow in wiring

- A. Draw the schematic diagram
- B. Draw the wiring diagram
- C. Use the wiring diagram

INFORMATION SHEET

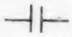
VII. Electrical schematic symbols

A. Transformer

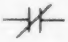


B. Contacts

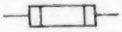
1. Normally open



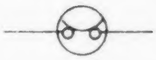
2. Normally closed



C. Fuse

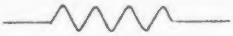


D. Fixed bimetal thermostat

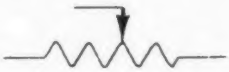


E. Resistor or load

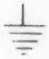
1. Fixed



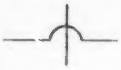
2. Variable



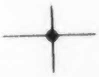
F. Ground connection



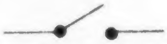
G. Wire crossover



H. Wire connection

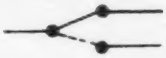


I. Single pole, single throw switch

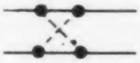


INFORMATION SHEET

J. Three-way switch

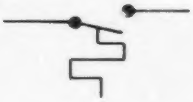


K. Four-way switch

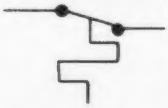


L. Thermostat

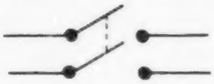
1. Closes on rise



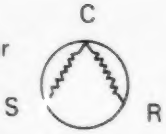
2. Opens on rise



M. Double pole, single throw switch

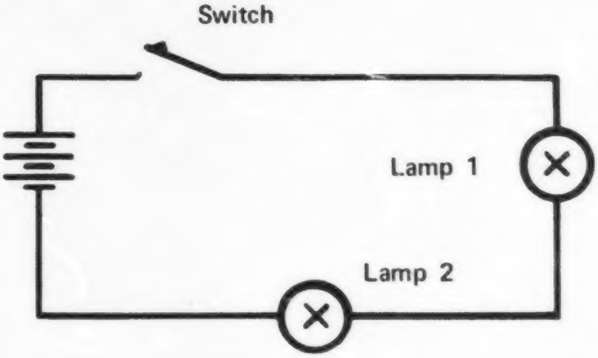


N. Single-phase motor



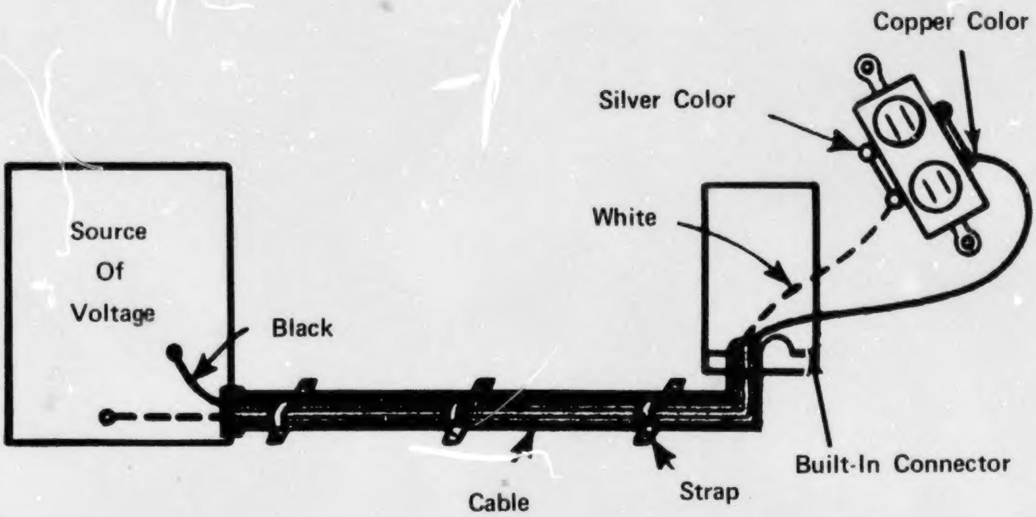
VIII. Schematic diagram vs wiring diagram

A. Schematic



INFORMATION SHEET

B. Wiring diagram



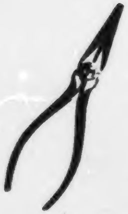
Electrical Wiring Tools

Hammer

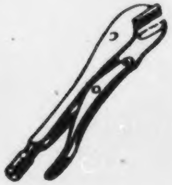
Electric Drill

Hacksaw

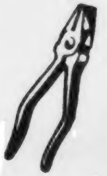
Keyhole Saw



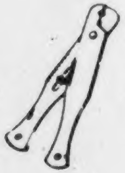
Needle Nose Pliers



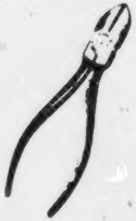
Vise-Grip Pliers



Line Technician's Pliers



Wire Cutter or Stripper



Diagonal Pliers

Electrical Wiring Tools

(Continued)

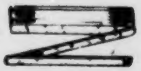
Phillips Screwdriver

Standard Screwdriver

Wood Chisel

Test Light

Conduit Bender



Tape or Rule

Volt-Ammeter

Pocket Knife

Fish Tape and Reel

ELECTRICAL WIRING PRACTICES
UNIT VI

JOB SHEET #1--REPAIR AN EXTENSION CORD PLUG

I. Equipment and materials

  A. Electrical plug in need of repair

  B. New electrical plug

  (CAUTION: Select only UL approved plugs.)

  C. Knife or scissors

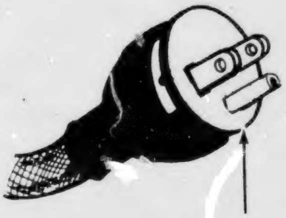
  D. Screwdriver

  E. Wire strippers or pliers

II. Procedure

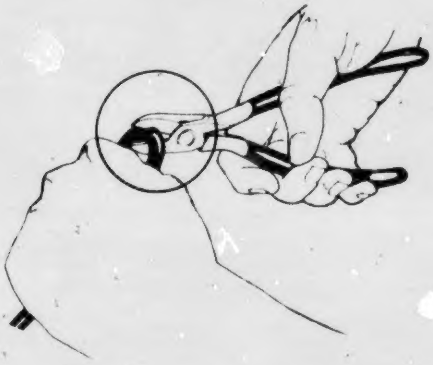
  A. Remove insulator (Figure 1)

FIGURE 1



  B. Use pliers, knife, or scissors to make a clean cut on cord insulation approximately 2" from end (Figure 2)

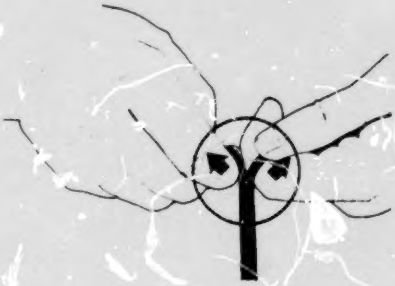
FIGURE 2



JOB SHEET #1

(NOTE: For flat cords, pull cord apart for a distance of about two inches. See Figure 3.)

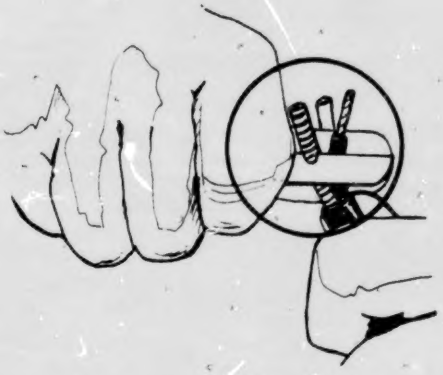
FIGURE 3



C. Strip approximately 1/2" insulation from the end of each conductor (Figure 4)

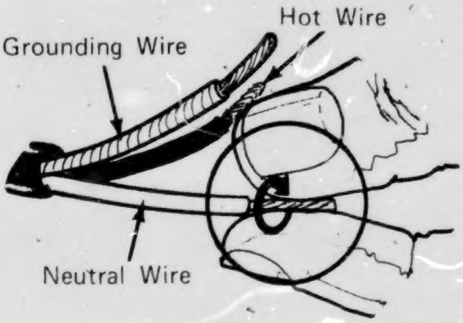
(CAUTION: Avoid cutting individual wires.)

FIGURE 4



D. Twist strands of each wire clockwise so they stay together neatly (Figure 5)

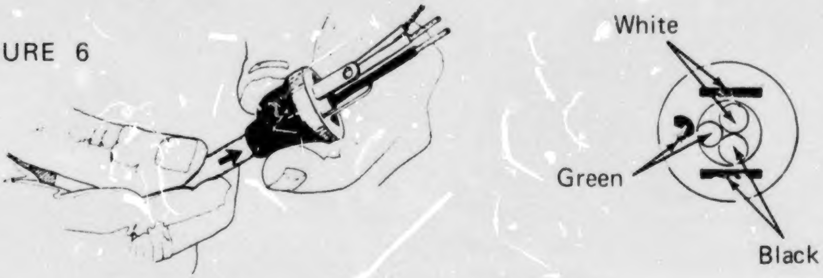
FIGURE 5



JOB SHEET #1

E. Push end of cord through back of plug (Figure 6)

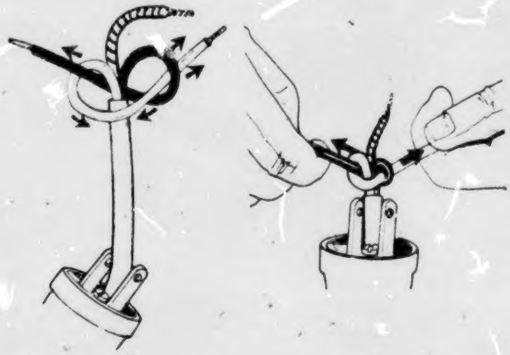
FIGURE 6



F. Make an Underwriters' knot using two sections (Figure 7)

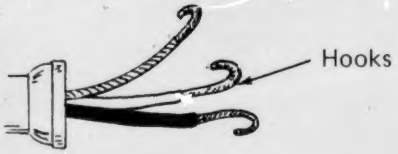
(NOTE: Because the knot is larger than the hole in the neck of the plug, it takes the strain and protects the wire connections inside the plug. A cord clamp may be used in place of the Underwriter's knot.)

FIGURE 7



G. Bend bare ends into a hook (Figure 8)

FIGURE 8

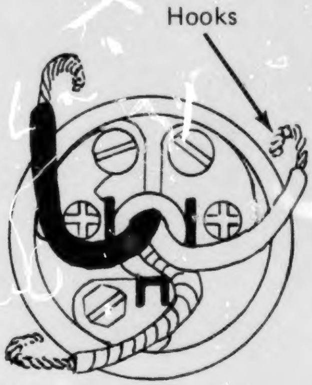


JOB SHEET #1

H. Bend wires around prongs (Figure 9)

(NOTE: This makes it easier to work wire into proper place.)

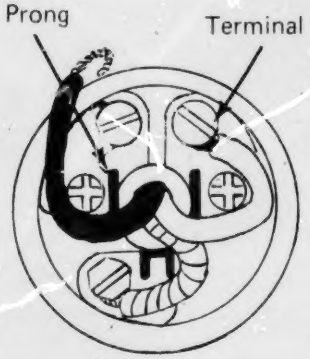
FIGURE 9



I. Wrap the bare wire under screw clockwise (Figure 10)

(NOTE: Always connect white or natural gray wire first, grounding wire second, and hot wire last. Always remove in reverse order.)

FIGURE 10

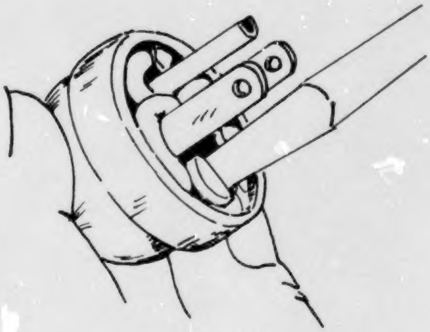


JOB SHEET #1

J. Tighten the screws (Figure 11)

(NOTE: Be neat!!! Avoid leaving any loose strands of wire!)

FIGURE 11

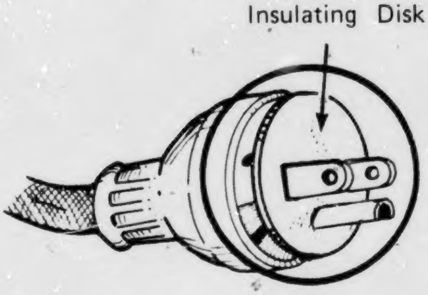


K. Fold the cord into the plug

L. Push excess wire into plug

M. Replace insulator (Figure 12)

FIGURE 12



ELECTRIC WIRING PRACTICES
UNIT VI

JOB SHEET #2--WIRE A LIGHTING OUTLET CONTROLLED BY A SINGLE POLE SWITCH WITH A DUPLEX RECEPTACLE

I. Tools and materials

   A. Standard screwdriver

   B. Line technician's pliers

   C. Needle nose pliers

   D. Knife or stripper

   E. Lighting outlet

   F. Octagon box

   G. Single pole switch

   H. Switch boxes, two

   I. Duplex receptacle

   J. Plywood, 2' x 3' x 1/4"

   K. 12-2 or 14-2 NM cable

   L. Safety glasses

   M. Solderless connectors

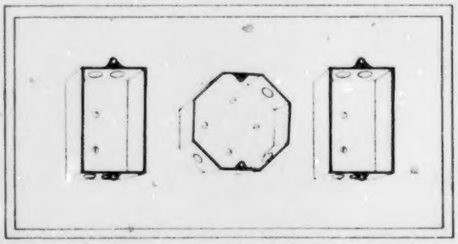
   N. Appropriate fasteners

II. Procedure

   (NOTE: Safety glasses should be worn at all times.)

   A. Attach boxes to plywood (Figure 1)

FIGURE 1



JOB SHEET #2

B. Measure cable and cut to proper length

(NOTE: Leave approximately 8" on each end sticking through the boxes.)

C. Remove plugs from each box so cable can be installed

D. Loosen screw in boxes on holddowns and install cables (Figure 2)

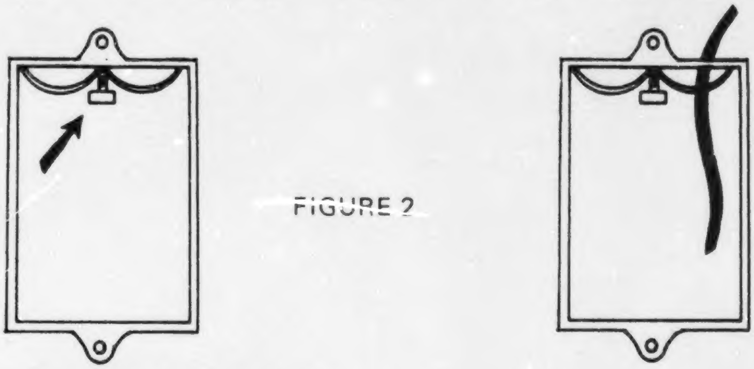


FIGURE 2

E. Tighten screws and holddowns

F. Remove 6" of outer insulation from the cable using the stripper or knife

(NOTE: Be careful not to cut your hand when using a knife.)

G. Remove 1/2" to 3/4" of insulation from the end of each wire

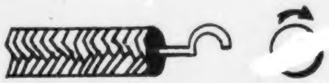
(CAUTION: Do not scratch or knick the wire when removing insulation.)

H. Connect single pole switch to wire

(NOTE: Connect the white wire to the brass screw and black wire to the silver screw. This is the only time a white wire will be connected to the brass screw and black wire connected to the silver screw. The black wire is referred to as the traveler wire on the switch leg.)

I. Place wires on terminals as shown in Figure 3

FIGURE 3

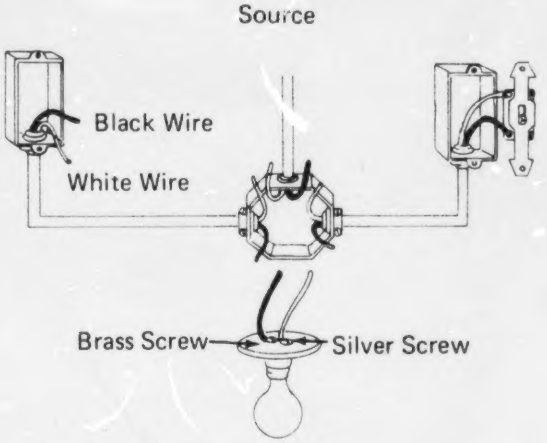


JOB SHEET #2

J. Connect the black wire to brass screw in lighting outlet

K. Connect the white wire from switch to black wire from source (Figure 4)

FIGURE 4



L. Install duplex receptacle

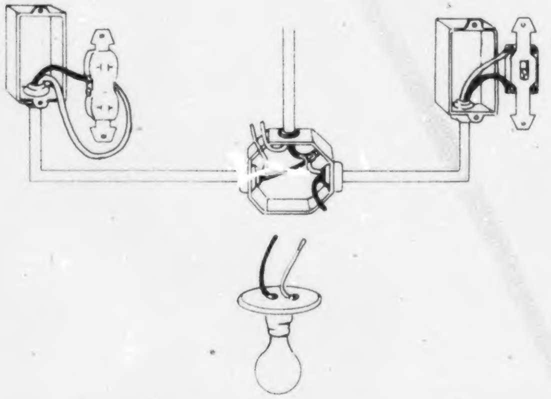
M. Connect black wire to brass screw on receptacle

N. Connect the white wire to silver screw on receptacle

O. Connect the black wire from the receptacle to the connection of black wire from the source in the octagon box with a solderless connector (Figure 5)

(NOTE: Twist the wire in the solderless connector so no bare wire is showing. If bare wire is showing, it may be necessary to tape it.)

FIGURE 5



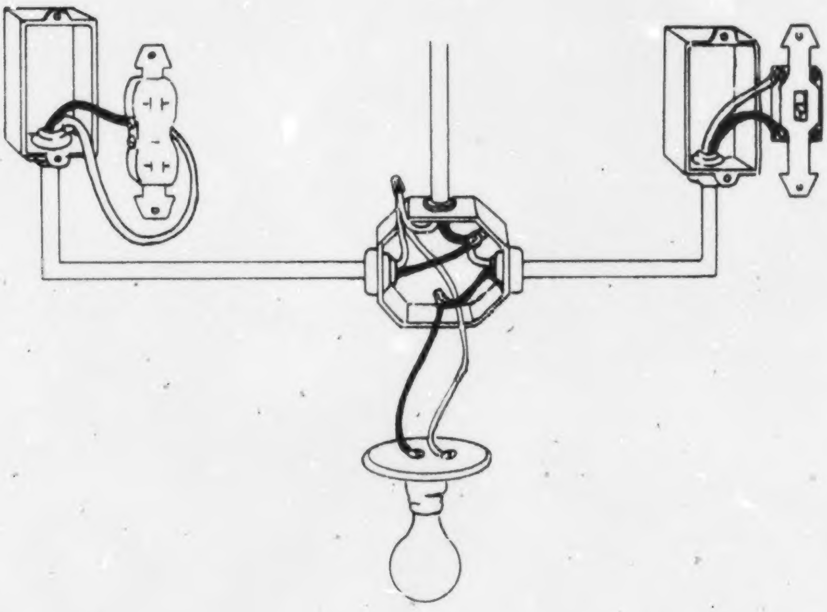
JOB SHEET #2

P. Cut a short pigtail wire (white) and connect to silver screw on lighting outlet

Q. Connect white wire from source, white wire from receptacle, and white pigtail from lighting outlet with a solderless connector inside the octagon box (Figure 6)

(NOTE: Make sure no bare wire is showing.)

FIGURE 6



(NOTE: Figure 6 is a diagram of the finished product. Turn in to instructor for evaluation.)

ELECTRICAL WIRING PRACTICES
UNIT VI

JOB SHEET #3--WIRE THREE DUPLEX RECEPTACLES USING NONMETALLIC CABLE

I. Tools and materials

A. Standard screwdriver

B. Line technician's pliers

C. Needle nose pliers

D. Knife or stripper

E. Duplex receptacles, three

F. Switch boxes for receptacles, three

G. Duplex receptacle cover plates, three

H. Plywood, 2' x 3' x 1/4"

I. 12-2-G NM wire, three pieces, 24 inches long

(NOTE: Mark wires no. 1, no. 2, and no. 3.)

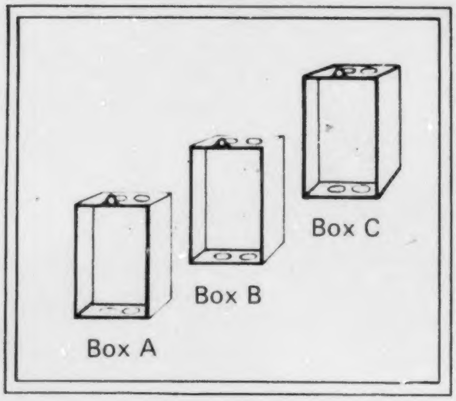
J. Safety glasses

II. Procedure

(NOTE: Safety glasses should be worn at all times.)

A. Secure boxes for receptacles to demonstration board (Figure 1)

FIGURE 1

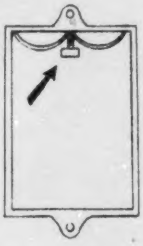


JOB SHEET #3

B. Remove knock-out plugs on boxes A and B on both ends but remove only one knock-out on box C

C. Loosen screw inside all three boxes (Figure 2)

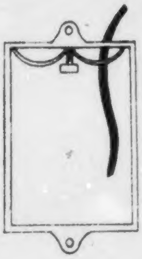
FIGURE 2



D. Start with box C and place wire 1 under screw plate, allowing six inches to extend from box; tighten screw

(CAUTION: Tighten screw firmly but do not cut insulation. See Figure 3.)

FIGURE 3



E. Place remaining end of wire 1 under screw plate of box B, allowing six inches to extend from the box; tighten screw

F. Place wire 2 in box B under screw plate of box, allowing six inches to extend from the box; tighten screw

G. Place the remaining end of wire 2 in box A under screw plate of box, allowing six inches to extend from box; tighten screw

H. Place wire 1 under screw plate of box A, allowing six inches to extend from the box

I. Remove approximately five inches of the outside insulation on each wire extending from switch box

(NOTE: Remember to use caution in removing insulation.)

JOB SHEET #3

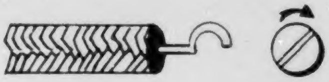
J. Remove approximately 1/2" to 3/4" of insulation from each wire extending from switch boxes

(NOTE: Remember to use caution in removing insulation from wires.)

K. Start with box C and attach black *hot wire* to brass side of receptacle

(NOTE: Wire should be placed around terminals according to the direction the screw tightens. See Figure 4.)

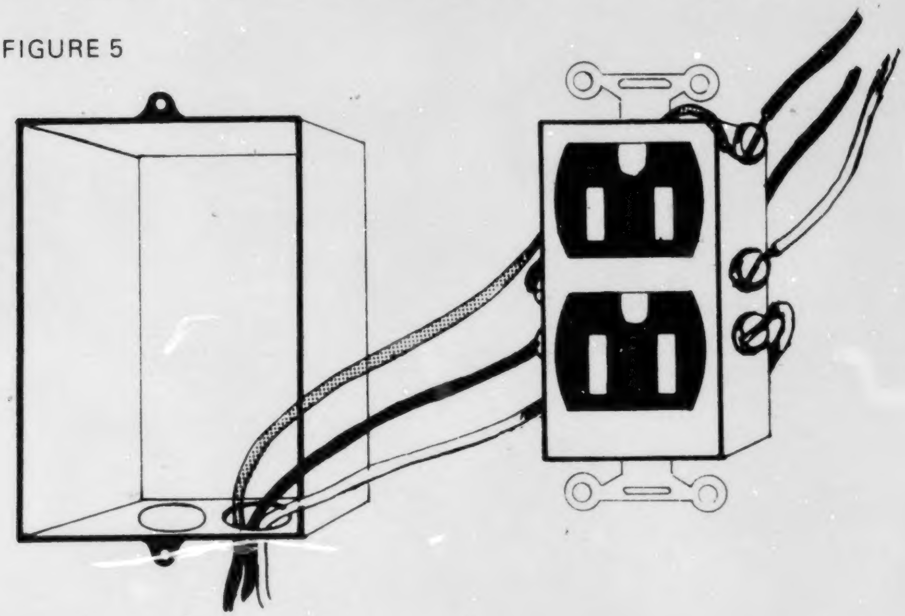
FIGURE 4



L. Attach white *neutral wire* to silver side of receptacle (Figure 5)

M. Attach bare *ground wire* to the top of receptacle (Figure 5)

FIGURE 5



N. Follow same procedure for attaching wires to receptacles A and B

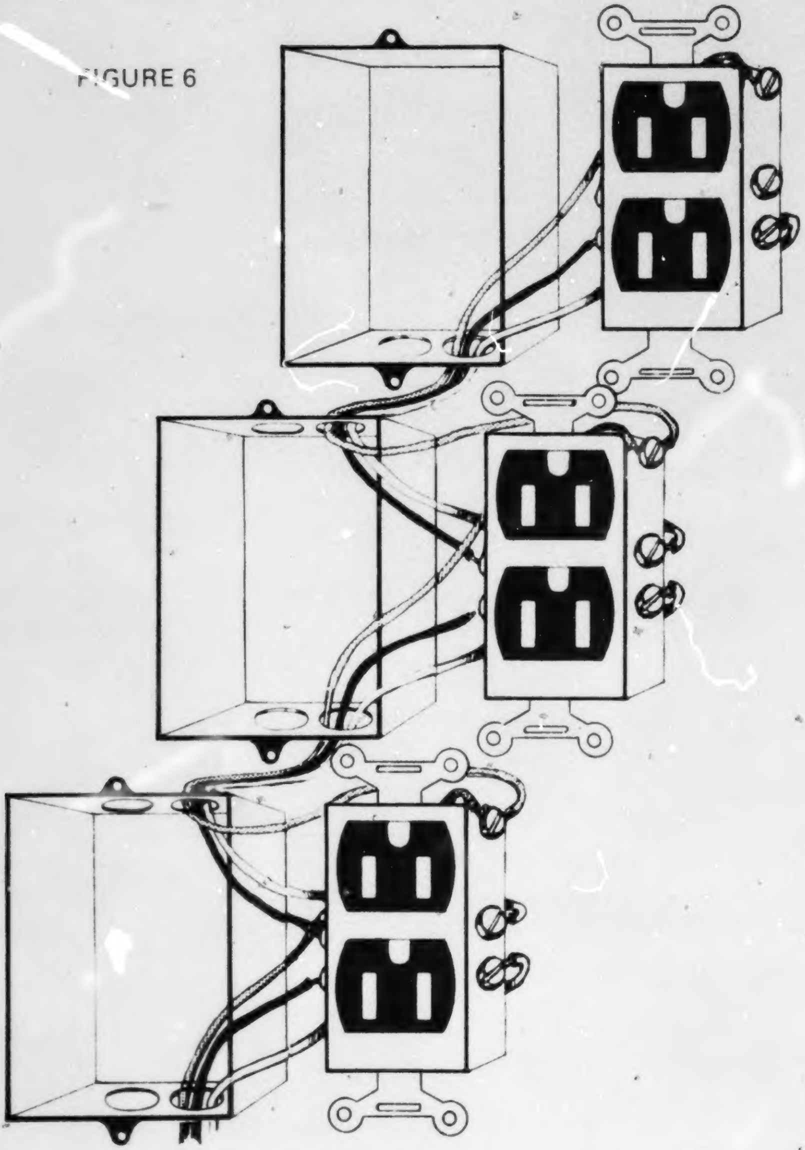
O. Assemble wires with receptacle and place in box; attach cover plate

JOB SHEET #3

P. Check with instructor for approval before attaching wire 3 to electrical source

(NOTE: Figure 6 is a diagram of the finished product. Turn in to instructor for evaluation.)

FIGURE 6



ELECTRICAL WIRING PRACTICES
UNIT VI

JOB SHEET #4--WIRE LIGHTING OUTLET CONTROLLED BY TWO THREE-WAY SWITCHES

I. Tools and materials

A. Standard screwdriver

B. Line technician's pliers

C. Needle nose pliers

D. Knife or stripper

E. Lighting outlet

F. Octagon box

G. Three-way switches and cover plates, two

H. Switch boxes, two

I. Black tape for tracer marking

J. 12/3 NM cable, two pieces, two feet long

(NOTE: In this job, the 12/3 NM cable contains three wires. White, the neutral wire, will be used as a hot carrier and requires a tracer wire marking. The black wire will be the hot wire, and the red wire will be used as a hot carrier wire.)

K. 12/2 NM cable, one piece, two feet long

L. Plywood, 2' x 3' x 1/4"

M. Safety glasses

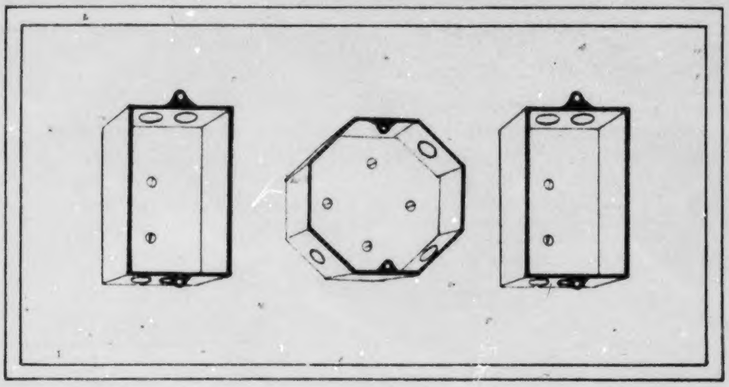
II. Procedure

(NOTE: Safety glasses should be worn at all times.)

A. Attach octagon box and both switch boxes to plywood (Figure 1)

JOB SHEET #4

FIGURE 1



B. Remove approximately six inches of the outside insulation on each end of the NM cable

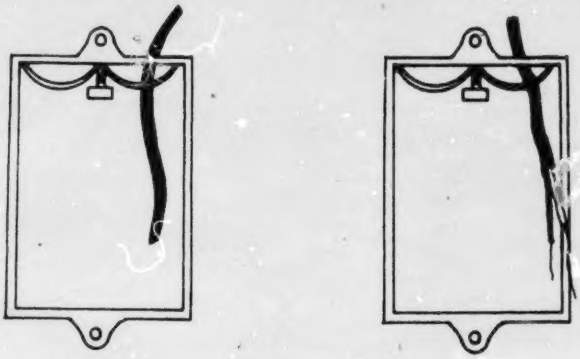
C. Remove knock-out plug from switch box and loosen screw in box; place one 12/3 NM cable under plate and allow approximately eight inches to extend from box; tighten screw

(CAUTION: Be careful not to tighten screw too tightly because it will cut the insulation on the wire.)

D. Remove 1/2" to 3/4" of insulation from wire

(CAUTION: This should be done in such a manner as to not scratch or mark the wire. See Figure 2.)

FIGURE 2



E. Remove knock-out plugs on octagon box located directly across from each other

F. Use the remainder of wire extending from switch box and run to octagon box; use same procedure for fastening wire to octagon box as in fastening to switch box

JOB SHEET #4

G. Repeat the same procedure with other 12/3 NM cable, connecting the other switch box to the octagon box

(NOTE: While conducting this step, you will need to repeat steps C, D, and F.)

H. Remove six inches of outside insulation from both ends of the 12/3 NM cable

I. Knock out one of the remaining plugs in the octagon box

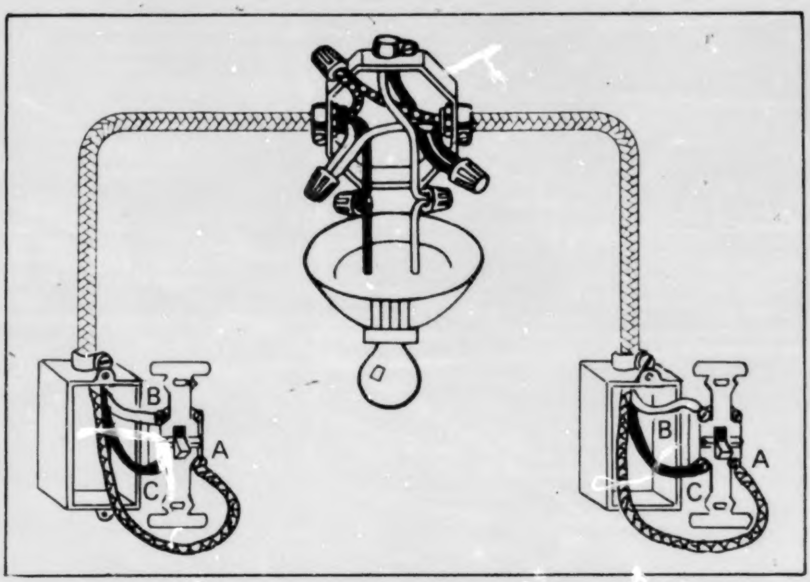
J. Pull eight inches of the cable through the box and secure to clamp; remove 1/2" to 3/4" of insulation from each wire

(CAUTION: This should be done in such a manner as to not scratch or mark the wire.)

(NOTE: The other end of this cable extending from octagon box will be connected to source at completion of job.)

K. Connect black wire to three-way switch on screw C in switch box 1; connect red wire to screw A and white wire with tracer to screw B (Figure 3)

FIGURE 3



JOB SHEET #4

L. Connect black wire to the other three-way switch on screw C in switch box 2, the red wire to screw A, and the white wire with tracer to screw B (Figure 3)

(NOTE: Wire should be placed around terminals on switch according to the way the screw turns.)

M. Connect the two red wires in the octagon box together using a pigtail splice

N. Connect the two white wires with tracers in the octagon box using a pigtail splice and connecting cap

O. Connect the black wire from the source to the black wire going to switch 1 using a pigtail splice

P. Connect the black wire from switch 2 to the brass screw on the light fixture

Q. Connect the white wire from source to the silver screw on the light fixture

(CAUTION: Check with instructor before performing the next three steps.)

R. Place wires in switch boxes and fasten switches to the boxes; install switch cover plates

S. Place wires in octagon box and fasten light fixture to box

(CAUTION: Do not overtighten fixture.)

T. Connect wire extending from octagon box to source

U. Turn switches off and on to see if job is correct

ELECTRICAL WIRING PRACTICES
UNIT VI

JOB SHEET #5--WIRE A RANGE PLUG

I. Tools and materials

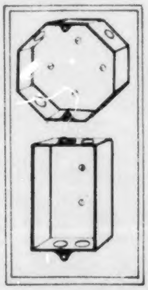
- A. Line technician's pliers
- B. Needle nose pliers
- C. Standard screwdriver
- D. Pocket knife
- E. Wire stripper
- F. Range plug
- G. 10-3-G or 8-3-G cable
- H. Plywood, 2' x 3' x 1/4"
- I. Safety glasses
- J. Cable connectors
- K. Switch box
- L. Octagon box

II. Procedure

(NOTE: Safety glasses should be worn at all times.)

- A. Remove cover from range plug
- B. Install switch box and octagon box on board (Figure 1)

FIGURE 1



JOB SHEET #5

C. Remove correct size knock-out plug from switch box

D. Install proper cable connector

E. Cut piece of cable to run from octagon box to range plug and install

(NOTE: Leave at least 8" of cable extending past the surface of the switch box.)

F. Strip cable's outer insulation at least 6"

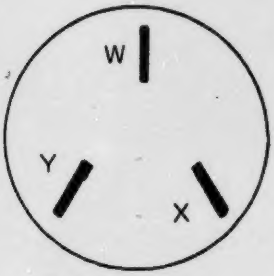
G. Strip 1/2" to 3/4" of insulation from end of each wire

(NOTE: Care should be taken not to knick or scratch wire.)

H. Connect the bare wire to grounding terminal in switch box

I. Connect the black, red, and white wires to terminal on range plug (Figure 2)

FIGURE 2

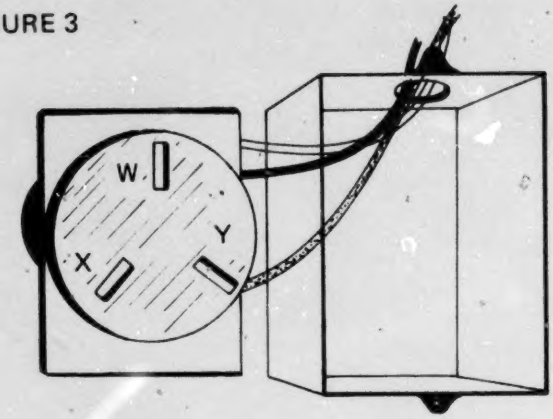


(NOTE: White conductor should be connected to terminal W or ground. Red and black conductors should be connected to terminals X and Y.)

(CAUTION: This device is for 240 volts and should be connected properly and grounded.)

JOB SHEET #5

FIGURE 3



(NOTE: Finished product should look similar to Figure 3. Turn in to instructor for evaluation.)

ELECTRICAL WIRING PRACTICES
UNIT VI

TEST

NAME__________ ______________________ SCORE__________________________

1. Match terms associated with electrical wiring to the correct definitions. Place the appropriate numbers in the blanks provided. Terms and definitions are continued on the following page.

_____a. Device which contains the splices when a circuit is tapped for an appliance or a light

_____b. Box-like device which is used to bring the wires to the location where a switch or outlet is installed; handy box

_____c. Thin-walled steel pipe used to protect electrical wires

_____d. Two or more stranded conductors grouped together in a flexible covering

_____e. Switch used to break the current in a single place

_____f. Two or more conductors grouped together inside an overall covering

_____g. Switch used to control lights and motors from two different places

_____h. Switch used to control lights and motors from three or more different places

_____i. Plan which shows the electric circuit with items arranged and appearing so the job of connecting will be simplified

_____j. Tool used to measure wire diameter

_____k. Line-type illustration using standardized symbols to represent an electrical circuit

1. Wire gauge
2. Four-way switch
3. Three-way switch
4. Single pole toggle switch
5. Conduit
6. Receptacle outlet
7. Outlet box
8. Cord
9. Cable
10. Wiring diagram
11. Schematic diagram

______l. Outlet box with a blank cover used to contain splices of a circuit

______m. Measure of wire diameter

______n. Device attached to the end of a wire or cable or to an electrical apparatus for convenience in making connections

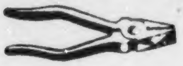
______o. Single conductor which carries electricity

______p. Wire, cords, or cables which carry the electricity or through which electricity flows

______q. Having slots or contact blades paired so as not to allow for a different contact arrangement

12. Polarized
13. Wire
14. Wire size
15. Junction box
16. Terminal
17. Conductors

2. Identify the following tools used in electrical wiring.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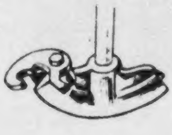
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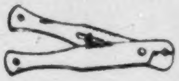
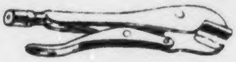
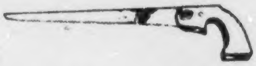
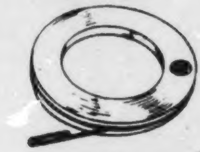

c. ______________


d. ______________


e. ______________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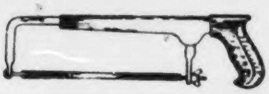
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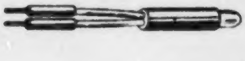
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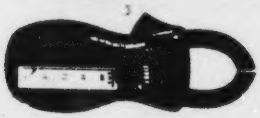
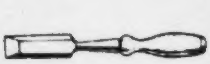
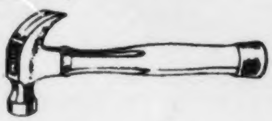
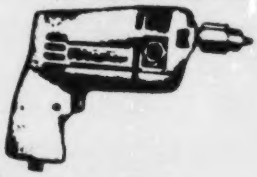
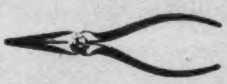

i. ______________

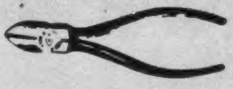

j. ______________


k. ______________


l. ______________



m. __________



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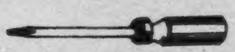
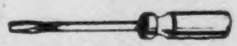


o. __________



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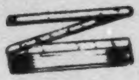

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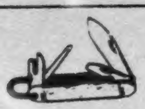
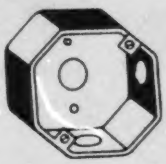
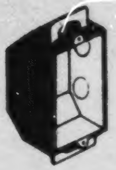


r. __________

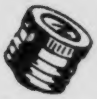
3. Identify the following electrical devices.



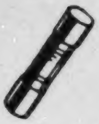
a. __________



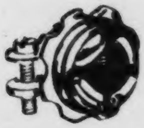
b. __________



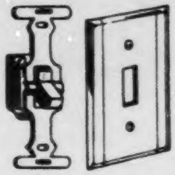
c. __________



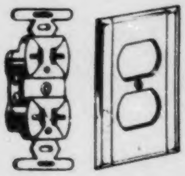
d. __________



e. __________



f. __________



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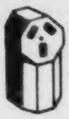

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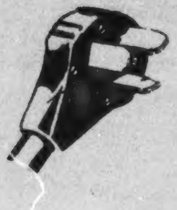
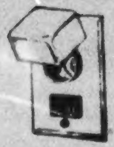


i. ______________________



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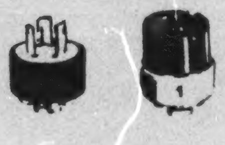
k. ______________________



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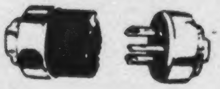

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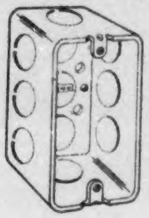

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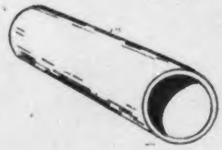

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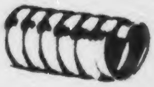

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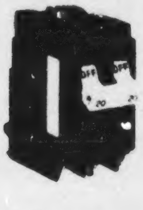

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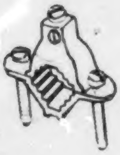

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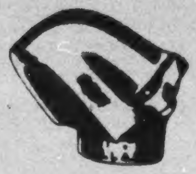
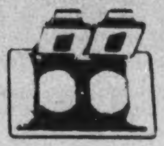
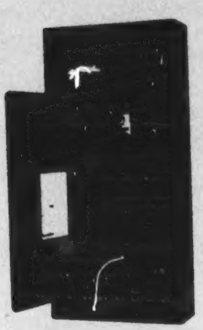




s. ______________________ t. ______________________



u. ______________________

4. Complete the following chart on conductors, types, and uses

ITEM	TYPE	USE
Wire	A	______________________
Wire	__________	Inside of conduit, dry and wet locations
Wire	USE	______________________
__________	TW (Low voltage)	Low voltage alarm or relay controls
Cord	HPN	______________________
Cord	S	______________________
Cord	HC	______________________
Cord	__________	Portable tools
Cord	__________	Vacuum cleaners, mixers
__________	Triplex	Outside, overhead service
Cable	__________	Underground, feeder and branch circuits
Cable	__________	Inside, dry locations

5. Name three factors affecting voltage drop.

a. ______________________________

b. ______________________________

c. ______________________________

6. Arrange in order the procedure to follow in wiring. Place a "1" in front of the first step, a "2" in front of the second, and so on.

______a. Use the wiring diagram

______b. Draw the schematic diagram

______c. Draw the wiring diagram

7. Match the electrical schematic symbols on the right to the correct names. Place the correct numbers in the blanks provided.

______a. Contacts, normally open

______b. Fixed bimetal thermostat

______c. Ground connection

______d. Single pole, single throw switch

______e. Single-phase motor

______f. Thermostat, opens on rise

______g. Transformer

______h. Fuse

______i. Resistor or load, fixed

______j. Wire connection

______k. Three-way switch

______l. Wire crossover

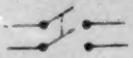
______m. Double pole, single throw switch

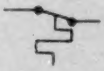
______n. Four-way switch

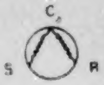
______o. Contacts, normally closed

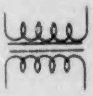
______p. Thermostat, closes on rise

______q. Resistor or load, variable

1. 

2. 

3. 

4. 

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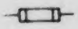
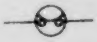
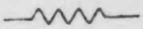
6. 

7. 

8. 

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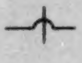
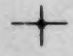
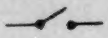
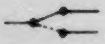
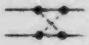
10. 

11. 

12. 

13. 

14. 

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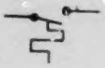
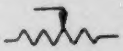
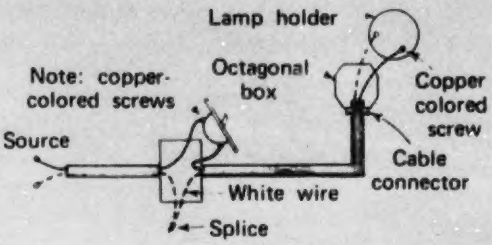
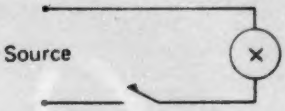
16. 

17. 

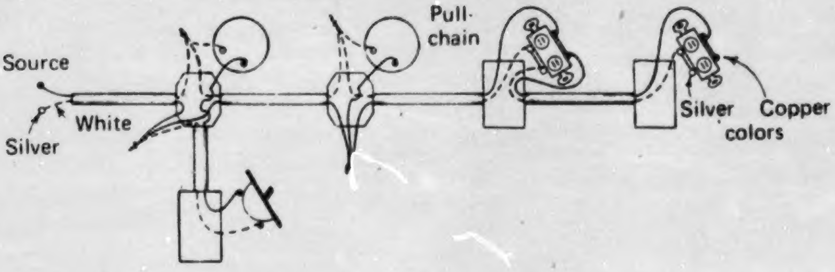
8. Distinguish between the following drawings by writing *schematic* or *wiring* under the appropriate diagrams.



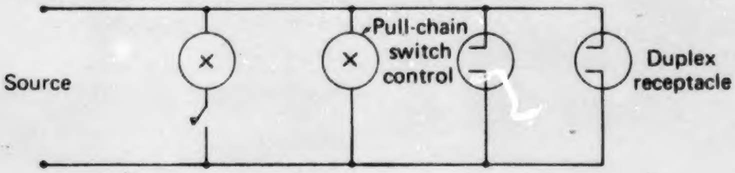
a. ______________________________



b. ______________________________



c. ______________________________



d. ______________________________

9. Demonstrate the ability to:

   a. Repair an extension cord plug.

   b. Wire a lighting outlet controlled by a single pole switch with a duplex receptacle.

   c. Wire three duplex receptacles using nonmetallic cable.

   d. Wire a lighting outlet controlled by two three-way switches.

   e. Wire a range plug.

(NOTE: If these activities have not been accomplished prior to the test, ask the instructor when they should be completed.)

ELECTRICAL WIRING PRACTICES
UNIT VI

ANSWERS TO TEST

1. a. 6
   b. 7
   c. 5
   d. 8
   e. 4
   f. 9
   g. 3
   h. 2
   i. 10
   j. 1
   k. 11
   l. 15
   m. 14
   n. 16
   o. 13
   p. 17
   q. 12

2. a. Line technician's pliers
   b. Conduit bender
   c. Wire cutter or stripper
   d. Vise-grip pliers
   e. Keyhole saw
   f. Fish tape and reel
   g. Hacksaw
   h. Test light
   i. Volt-ammeter
   j. Wood chisel
   k. Hammer
   l. Electric drill
   m. Needle nose pliers
   n. Diagonal pliers
   o. Phillips screwdriver
   p. Standard screwdriver
   q. Tape or rule
   r. Pocket knife

3. a. Octagon box
   b. Beveled corner wall box with plaster ears
   c. Edison base plug fuse
   d. Cartridge fuse
   e. Connector
   f. Toggle switch and cover
   g. Duplex grounding receptacle and cover
   h. Surface mount range receptacle
   i. Heavy duty plug

j. Fuse box cover with grounded outlet for fractional horsepower motor protection

k. Surface mount duplex grounding receptacle

l. Three wire twist lock connector and plug

m. Crow foot plug and connector

n. Handy box

o. Rigid steel conduit

p. Flexible steel conduit

q. 240-volt breaker

r. Ground clamp

s. Service entrance cap (weather head)

t. Weatherproof wall plate

u. Distribution panel

4.

ITEM	TYPE	USE
Wire	A	Heating appliances within apparatus, dry locations
Wire	TW	Inside of conduit, dry and wet locations
Wire	USE	Trench, underground
Wire	TW (Low Voltage	Low voltage alarm or relay controls
Cord	HPN	Heater cord
Cord	S	Hard usage, welders, large motors
Cord	HC	Iron, heaters
Cord	SJ	Portable tools
Cord	SV	Vacuum cleaners, mixers
Cable	Triplex	Outside, overhead service
Cable	UF	Underground, feeder and branch circuits
Cable	NM	Inside, dry locations

5. Any three of the following:
   a. Length of wire
   b. Size of wire
   c. Number of amperes flowing through wire
   d. Type of conductor

6. a. 3
   b. 1
   c. 2

7. a. 5
   b. 7
   c. 9
   d. 12
   e. 3
   f. 2
   g. 4
   h. 6
   i. 8
   j. 11
   k. 13
   l. 10
   m. 1
   n. 14
   o. 15
   p. 16
   q. 17

8. a. Wiring
   b. Schematic
   c. Wiring
   d. Schematic

9. Performance skills evaluated to satisfaction of instructor

ELECTRIC MOTORS
UNIT VII

UNIT OBJECTIVE

After completion of this unit, the student should be able to identify types of motors and motor enclosures. The student should be able to match electric motors to their correct capabilities, interpret motor nameplate information, and clean an electric motor. This knowledge will be evidenced by completion of assignment sheet, job sheet, and unit test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with electric motors to the correct definitions.
2. Identify types of A.C. single-phase, induction-run motors.
3. Match types of electric motors to the correct capabilities.
4. Select from a list electric motor requirements.
5. Name three factors to consider in selecting electric motors.
6. Select from a list factors to consider when replacing an electric motor.
7. Identify types of motor enclosures.
8. Select types of protective devices for electric motors.
9. Name common motor enemies.
10. Arrange in order procedure to follow prior to starting a new electric motor.
11. Interpret nameplate information.
12. Demonstrate the ability to clean an electric motor.

ELECTRIC MOTORS
UNIT VII

SUGGESTED ACTIVITIES

I. Suggested activities for instructor:

   A. Provide student with objective sheet.

   B. Provide student with information, assignment, and job sheets.

   C. Make transparencies.

   D. Discuss unit and specific objectives.

   E. Discuss information and assignment sheets.

   F. Demonstrate and discuss procedures outlined on the job sheet.

   G. Secure electric motors for student to use in class.

   H. Make a display of the different types of motors and motor enclosures.

   I. Give test.

II. Instructional materials:

   A. Objective sheet

   B. Information sheet

   C. Transparency masters

      1. TM 1--Types of Electric Motors

      2. TM 2--Types of Motor Enclosures

      3. TM 3--Motor Nameplate Information

   D. Assignment Sheet #1--Interpret Nameplate Information

   E. Job Sheet #1--Clean an Electric Motor

   F. Test

   G. Answers to test

III. Unit references:

   A. *Farm Utility Building.* Athens, Georgia: American Association of Vocational Instructional Materials, 1972.

   B. Morford, V. J. *Farm and Dairy Mechanics.* Minneapolis, Minnesota: Burgess Publishing Co., n.d.

C. Brown, Robert H. *Farm Electrification.* New York: McGraw-Hill Book Co., Inc., 1956.

D. *Electric Motors.* Athens, Georgia: American Association of Vocational Instructional Materials, 1972.

E. Anderson, Edwin P. *Electric Motors.* Indianapolis, Indiana: Howard W. Sams Co., Inc., 1972.

F. Wantiez, Gary. *Air Conditioning and Refrigeration, Book Two.* Stillwater, Oklahoma: Mid-America Vocational Curriculum Consortium, 1977.

ELECTRIC MOTORS
UNIT VII

INFORMATION SHEET

I. Terms and definitions

   A. Split-phase motor--Cheapest electric motor available; used for easy starting loads

   B. Induction-run motor--Motor that runs by induced current and does not have windings in the rotor

   C. Repulsion-start motor--Motor that has windings in the rotor and also has brushes and a commutator

   D. Capacitor-start motor--Motor that has a capacitor in the starting windings

   E. Horsepower (hp)--Unit of mechanical power which is equal to 746 watts of electrical power

   F. Short circuit--Improper connection between hot and neutral wires or between hot wires

   G. Three-phase motor--Most rugged, reliable, and satisfactory type of motor available; used for fairly difficult starting loads

   H. Service factor--Multiplier indicating the amount of overload permitted for the motor

   I. rpm--Number of revolutions a motor will turn per minute

   J. Automatic motor control--Switch, relay, and/or a contactor capable of responding to a device that senses variations in temperature, humidity, light, and pressure

   K. Relay (switch)--Device capable of utilizing a sensing signal to open and close a circuit

   L. Power factor--That factor by which the volt-ampere product must be multiplied in order to obtain the actual power

   M. Commutator--Switch used for reversing the direction of an electric motor

II. A.C. single-phase, induction-run motors (Transparency 1)

   A. Split-phase

   B. Repulsion-start

   C. Capacitor-start, capacitor-run

   D. Repulsion-start, capacitor-run

INFORMATION SHEET

III. Electric motors and their capabilities

MOTORS	STARTING ABILITY	STARTING CURRENT	STARTING MECHANISM	SPEED	VOLTAGE	COST & SIZE	APPLICATION
Split-Phase	Easy-to-start loads	Draws 6 to 8 times its normal running current	Two windings	Constant	120 or 240	Cheapest; 1/20 to 3/4 hp	Light farm work; used on such tools as pumps, grinders, and fans
Capacitor-Start, Induction-Run	Fairly difficult starting loads	Draws 3 to 6 times its full load	Two windings	Constant	120 or 240	25 to 40 percent more than the same size split-phase motor; 1/6 to 10 hp	Heavy-duty farm use, such as air compressors, power tools, and feed grinders
Capacitor-Start, Capacitor-Run	Hard starting loads	Draws 3 to 5 times its normal running current	Has a running capacitor and a special slow starting mechanism	Constant 900 to 3600 rpm	120/240 under 2 hp 240 over 2 hp	20 percent more than capacitor-start, induction-run; 1/2 to 25 hp	General purpose farm use, such as pumps, blowers, and conveyors
Repulsion-Start, Induction-Run	Very heavy starting loads	Draws 3 times the running current	No starting winding but has two running windings	Constant 1200 to 1800 rpm	120 and 240	Similar to capacitor motors; 1/6 to 20 hp	Large general purpose farm use, such as feed mills, compressors, and silo unloaders
Universal	Easy starting		Brushes	Varies	120	Very economical; 1/20 to 1 hp	Shop tools, such as drills and saws
Shaded-Pole	Easy starting		Shaded windings, slow starting	Varies	120	Very economical; 1/20 to 1/4 hp	Small household fans, blowers, and hair dryers
Three-Phase	Variety of starting loads; usually for heavy, hard starting	Can be designated as having low, normal, or high; 3 to 4 times the running current	Self starting	Constant 400 to 3600 rpm	Voltage varies; used on very high voltage	Expensive; 1/2 to many hundred hp	Loads requiring 10 hp or greater

INFORMATION SHEET

IV. Electric motor requirements

A. Must start the equipment load

B. Must drive the load once it is started

C. Must survive the abuse of the surroundings in which it operates

V. Factors in selecting electric motors

A. Type of electrical power available

(NOTE: It may be single-phase or three-phase.)

B. Type and size of load

C. Condition under which motor must operate

VI. Replacing electric motors

A. Horsepower rating must be the same or not more than one size larger

B. Full-load speed, cycles, duty, and base must be the same

C. Voltage should be 120 and/or 240

(NOTE: A 240 voltage is preferred for 1/2 hp and larger.)

D. Type should be the same

(NOTE: Type should be the same as the motor being replaced or should be of equal or greater starting torque.)

VII. Types of motor enclosures (Transparency 2)

A. Open drip-proof

(NOTE: The open drip-proof motor enclosure is used on most farms where water is not being sprayed.)

B. Splash-proof

(NOTE: This type is designed for either indoor or outdoor use, such as in milk barns or for irrigation pumps.)

C. Totally enclosed

(NOTE: The totally enclosed type is used where dust and grit are a problem.)

D. Totally enclosed explosion-proof

(NOTE: This type is used around explosive materials such as oil and gasoline.)

INFORMATION SHEET

VIII. Protection for electric motors

- A. Built-in overload protection in motor
- B. Manual starting switch with overload protection
- C. Magnetic starting switch with overload protection
- D. Time-delay fuse in motor for disconnect switch

IX. Common motor enemies

- A. Dust
- B. Stray oil
- C. Moisture
- D. Bearing friction
- E. Pulley misalignment
- F. Vibration
- G. Uneven wear
- H. Overload

X. Procedure to follow prior to starting a new motor

- A. Dry out all moisture

  (NOTE: This may be achieved by placing motor in an oven and baking at a temperature not to exceed 85°C.)

- B. Make sure voltage output from electrical source agrees with motor rating
- C. Check all motor connections
- D. Turn armature by hand to check for free rotation
- E. Connect motor to electrical source and operate without a load

  (NOTE: This will allow you to examine motor to see that there is no unusual localized heating.)

INFORMATION SHEET

XI. Nameplate information (Transparency 3, Assignment Sheet #1)

A. Type of current

Examples: Alternating or direct; single-phase or three-phase

B. Type of overload protection

(NOTE: The term *thermalguard* is a manufacturer's identification for a specific overload protection device built into the motor.)

C. Horsepower

D. rpm

(NOTE: This indicates the speed of the motor shaft.)

E. Temperature at which motor is to operate

F. Hours that motor can be operated continuously

G. Voltage

H. Type of enclosure

I. Motor type

(NOTE: The various manufacturers usually use different letters and symbols to identify the various types of motors as to their starting mechanism. The symbols used most often are **sp** for split-phase, **cs** for capacitor-start, and **rs** for repulsion-start.)

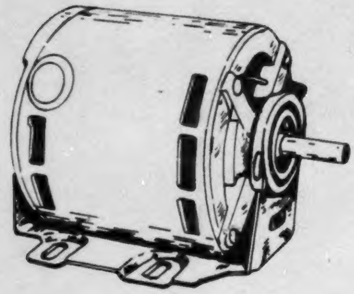
J. Type of frame

K. Cycle

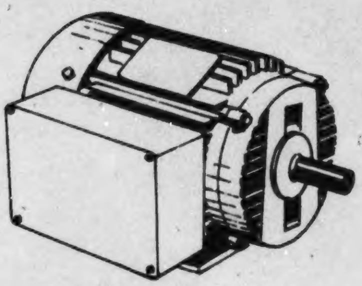
L. Serial number

(NOTE: This number should be used when writing to the manufacturer regarding the specific motor.)

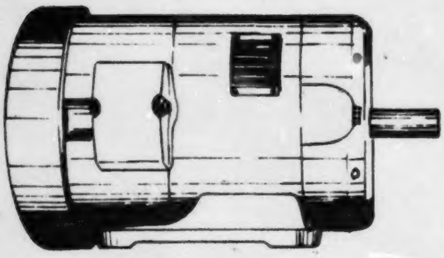
Types of Electric Motors



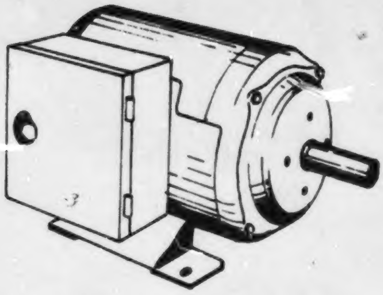
Split-Phase



Capacitor-Start, Capacitor-Run

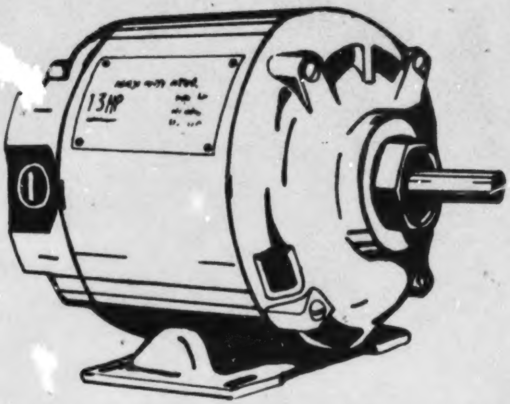


Repulsion-Start

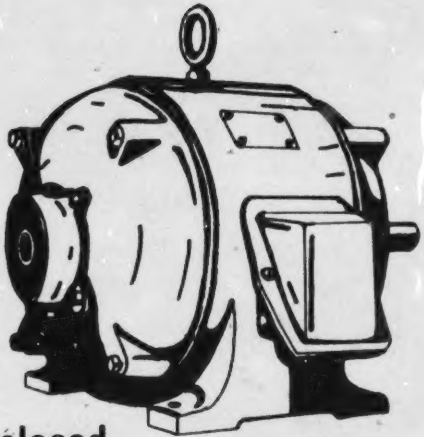


Repulsion-Start, Capacitor-Run

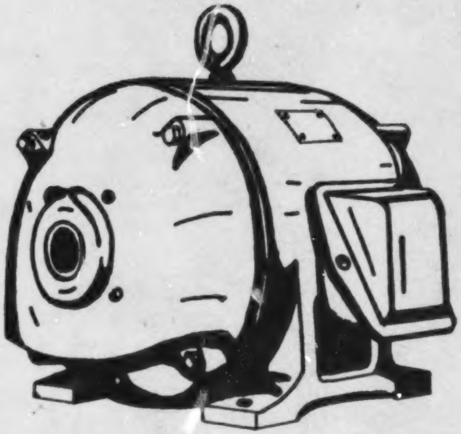
Types of Motor Enclosures



Open Drip-Proof



Totally Enclosed



Splash-Proof

Motor Nameplate Information

POWER **ELECTRIC**

A. C. MOTOR

MODEL	500	TYPE	KC	PHASE	1
HP	1½	HERTZ (CYCLES)	60	F.L.A.	15/7.5
VOLTS	120/240	RPM	1725		
TEMP RISE	40° C	L.R.A.	80/40		
DUTY RATING	CONTINUOUS	SERIAL NO.	25803		
CODE		S.F.	1.25	FR	66

ELECTRIC MOTORS
UNIT VII

ASSIGNMENT SHEET #1--INTERPRET NAMEPLATE INFORMATION

Select an electric motor that is in your school shop or at your home and complete the following questions. When finished, return to instructor for evaluation.

1. What is the horsepower of the motor? ______________________

2. What does the horsepower fraction tell you? ______________________

____

3. What is the rpm of the motor? ______________________

4. What does *rpm* tell you about this particular motor? ______________

____

5. What is the recommended voltage to which this motor should be connected?

____

6. What type of overload protection does the motor have? ____________

7. For how long is the motor designed to operate? ______________

8. Under what temperature will the motor operate? ______________

9. What type of enclosure does the motor have? ______________

10. With this type of enclosure, where would you recommend using it?

____

11. What is the serial number? ______________________

12. When would you use the serial number of a motor? ____________

____

13. At how many cycles does the motor operate per second? __________

14. What is the motor type? ______________________

15. What type of current does the motor use? ______________________

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JOB SHEET #1--CLEAN AN ELECTRIC MOTOR

I. Tools and materials

- A. Electric motor
- B. Standard screwdriver
- C. Open-end adjustable wrench
- D. Tire pump or vacuum cleaner
- E. Center punch
- F. Hammer
- G. Small socket wrench set
- H. Soft-faced mallet
- I. Nonflammable cleaning fluid
- J. Clean rags (lintless)

II. Procedure

- A. Disconnect motor and remove from mounting
- B. Clean outer surface of motor
- C. Disconnect wires at motor

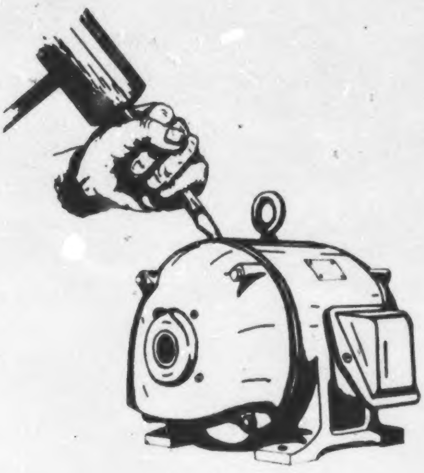
  (NOTE: Draw a simple schematic diagram of the wire connections and label according to color. This will enable you to reconnect the motor correctly.)
- D. Remove motor pulley

JOB SHEET #1

E. Mark end bells (Figure 1)

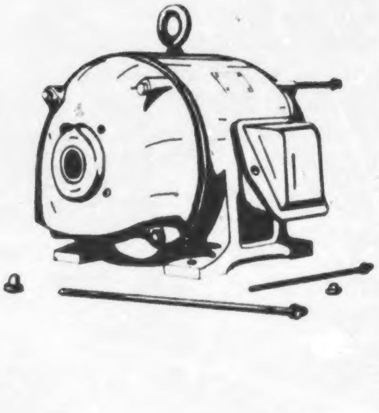
(NOTE: This is to keep end bells in their proper places. Using center punch, place one mark on pulley end bell and two marks on opposite end bell; mark housing in the same way.)

FIGURE 1



F. Remove bolts holding end bells (Figure 2)

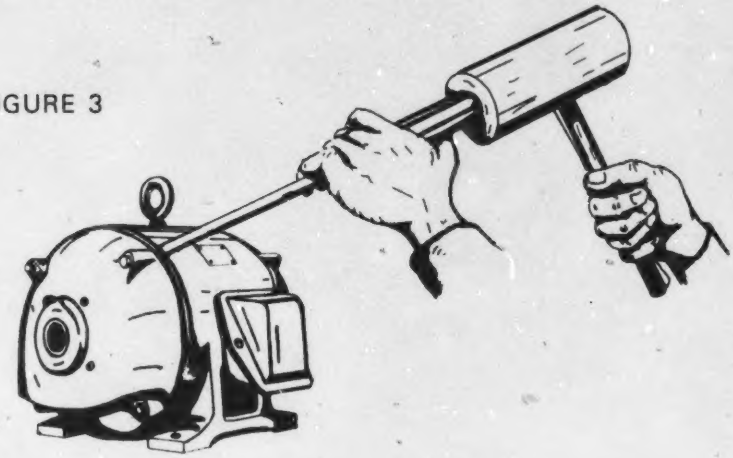
FIGURE 2



JOB SHEET #1

G. Use soft-faced mallet and screwdriver to tap end bells loose (Figure 3)

FIGURE 3



H. Remove end bell that does not contain the starting switch or brush ring

(NOTE: Observe position and number of shims as you remove the rotor.)

I. Remove end bell containing starting switch

(CAUTION: Do not attempt to remove stator.)

J. Clean points with very fine sandpaper

(CAUTION: Do not use emery cloth.)

K. Clean all parts of motor using special cleaning fluid

(NOTE: Do not get liquid on wires.)

L. Use tire pump or vacuum cleaner to dry parts

M. Clean bearings and make sure wicking is in place

N. Replace end bell containing switch

O. Insert rotor, making sure shims are in place

(NOTE: A drop of oil should be placed on bearing part of the shaft.)

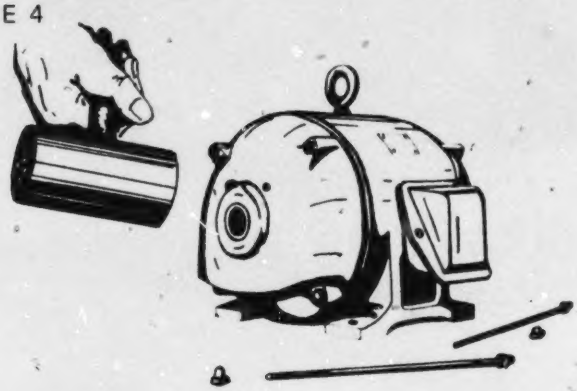
JOB SHEET #1

P. Check position of end bells with center punch marks

(NOTE: The lubricating oil fitting should be pointed up. The window in the bearing should be opposite the load on the shaft.)

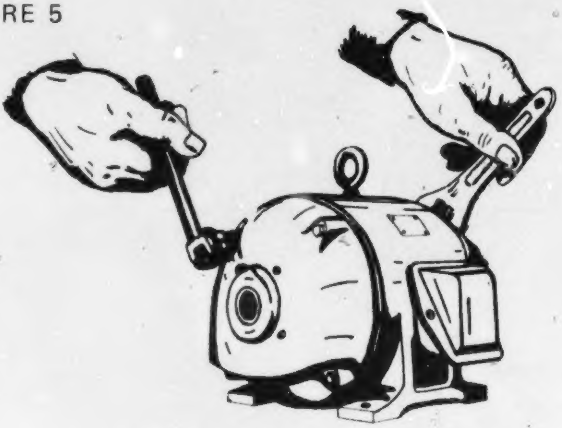
Q. Use soft-faced hammer to tap bells in place (Figure 4)

FIGURE 4



R. Insert end bell bolts and tighten (Figure 5)

FIGURE 5



S. Turn shaft by hand

(NOTE: If it is tight, end bells may not be in proper alignment or the wicking may be between bearing and shaft.)

T. Connect temporary leads and test motor

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TEST

NAME ____ SCORE ________________

1. Match the terms on the right to the correct definitions.

_____a. Switch used for reversing the direction of an electric motor

_____b. Cheapest electric motor available; used for easy starting loads

_____c. That factor by which the volt-ampere product must be multiplied in order to obtain the actual power

_____d. Motor that runs by induced current and does not have windings in the rotor

_____e. Device capable of utilizing a sensing signal to open and close a circuit

_____f. Motor that has windings in the rotor and also has brushes and a commutator

_____g. Switch, relay, and/or a contactor capable of responding to a device that senses variations in temperature, humidity, light, and pressure

_____h. Motor that has a capacitor in the starting windings

_____i. Number of revolutions a motor will turn per minute

_____j. Unit of mechanical power which is equal to 746 watts of electrical power

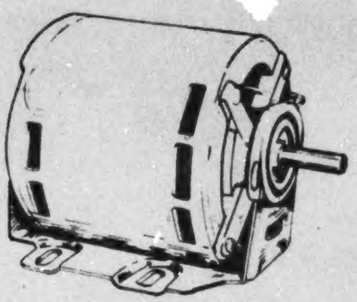
_____k. Multiplier indicating the amount of overload permitted for the motor

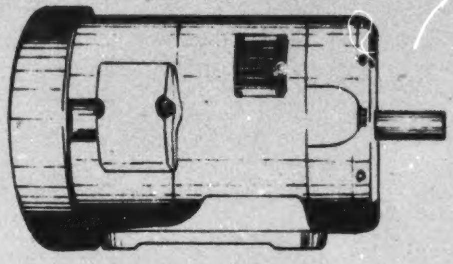
_____l. Improper connection between hot and neutral wires or between hot wires

_____m. Most rugged, reliable, and satisfactory type of motor available; used for fairly difficult starting loads

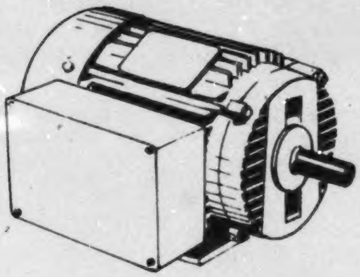
1. Relay (switch)
2. Power factor
3. Commutator
4. Repulsion-start motor
5. Service factor
6. Split-phase motor
7. rpm
8. Automatic motor control
9. Induction-run motor
10. Horsepower (hp)
11. Short circuit
12. Three-phase motor
13. Capacitor-start motor

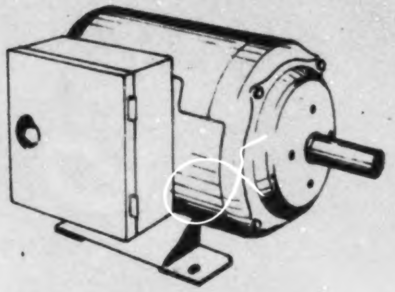
2. Identify the following types of A.C. single-phase, induction-run motors.





a. ______________________ b. ______________________





c. ______________________ d. ______________________

3. Match the electric motors on the right to the correct capabilities.

_____a. Easy starting motor used on 120-volt service; usually used in fans and blowers

_____b. Motor that is used to start easy loads but will draw 6 to 8 times its normal running current while starting

_____c. Motor that is used on heavy starting loads while drawing only 3 times its running current; has no starting windings but has 2 running windings

_____d. Motor that is used on fairly difficult starting loads while drawing 3 to 6 times its full load on start; recommended for heavy-duty farm use

1. Split-phase
2. Shaded-pole
3. Three-phase
4. Repulsion-start, induction-run
5. Capacitor-start, capacitor-run
6. Capacitor-start, induction-run

_____e. Very expensive motor that has a variety of starting loads; also has a self-starting mechanism and can be used on very high voltage

_____f. Motor that is recommended for hard starting loads, normally draws 3 to 5 times its normal running current, and has a special slow starting mechanism along with a running capacitor

4. Select electric motor requirements from the list below by placing an "X" in the appropriate blanks.

_____a. Must start the equipment load

_____b. Must operate economically

_____c. Must drive the load once it is started

_____d. Must survive the abuse of the surroundings in which it operates

5. Name three factors to consider in selecting electric motors.

a. ____

b. ____

c. ____

6. Select from the list below factors to consider when replacing an electric motor.

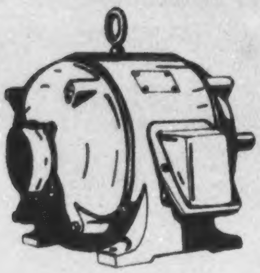
_____a. Type does not have to be the same

_____b. Voltage should be 120 and/or 240

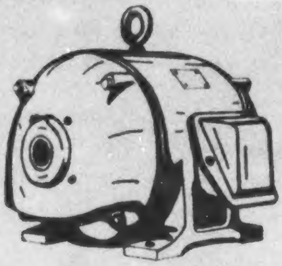
_____c. Full-load speed, cycles, duty, and base must be the same

_____d. Horsepower rating does not apply

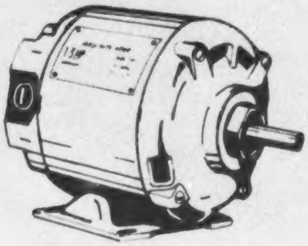
7. Identify the following types of motor enclosures.



a. ______________________________



b. ______________________________



c. ______________________________

8. Select from the list below types of protective devices for electric motors. Place an "X" in the appropriate blanks.

_____a. Time-delay fuse in motor for disconnect switch

_____b. Totally enclosed motor

_____c. Built-in overload protection in motor

_____d. Grounded wire

_____e. Magnetic starting switch with overload protection

_____f. Manual starting switch with overload protection

9. Name five common motor enemies.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

10. Arrange in order the procedure to follow prior to starting a new electric motor.

______a. Check all motor connections

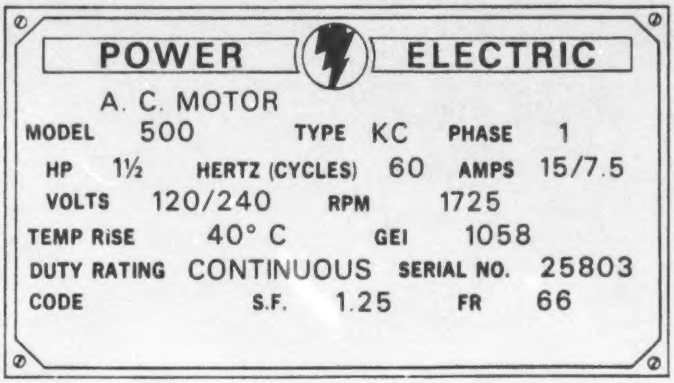
______b. Connect motor to electrical source and operate without a load

______c. Dry out all moisture

______d. Turn armature by hand to check for free rotation

______e. Make sure voltage output from electrical source agrees with motor rating

11. Interpret the nameplate below by answering the following questions.



POWER ELECTRIC

A. C. MOTOR

MODEL 500 TYPE KC PHASE 1

HP 1½ HERTZ (CYCLES) 60 AMPS 15/7.5

VOLTS 120/240 RPM 1725

TEMP RISE 40° C GEI 1058

DUTY RATING CONTINUOUS SERIAL NO. 25803

CODE S.F. 1.25 FR 66

a. What phase is the motor? ______________________________

b. What is the horsepower rating? ______________________________

c. What is the duty rating? ______________________________

d. What is the serial number? ______________________________

e. What is the rpm rating? ______________________________

12. Demonstrate the ability to clean an electric motor.

(NOTE: If this activity has not been accomplished prior to the test, ask the instructor when it should be completed.)

ELECTRIC MOTORS
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ANSWERS TO TEST

1.
    - a. 3
    - b. 6
    - c. 2
    - d. 9
    - e. 1
    - f. 4
    - g. 8
    - h. 13
    - i. 7
    - j. 10
    - k. 5
    - l. 11
    - m. 12
2.
    - a. Split-phase
    - b. Repulsion-start
    - c. Capacitor-start, capacitor-run
    - d. Repulsion-start, capacitor-run
3.
    - a. 2
    - b. 1
    - c. 4
    - d. 6
    - e. 3
    - f. 5
4. a, c, d
5.
    - a. Type of electrical power available
    - b. Type and size of load
    - c. Condition under which motor must operate
6. b, c
7.
    - a. Totally enclosed
    - b. Splash-proof
    - c. Open drip-proof
8. a, c, e, f

9. Any five of the following:
    - a. Dust
    - b. Stray oil
    - c. Moisture
    - d. Bearing friction
    - e. Pulley misalignment
    - f. Vibration
    - g. Uneven wear
    - h. Overload

10.
    - a. 3
    - b. 5
    - c. 1
    - d. 4
    - e. 2

11.
    - a. Single
    - b. 1 1/2
    - c. Continuous
    - d. 25803
    - e. 1725

12. Performance skills evaluated to the satisfaction of instructor